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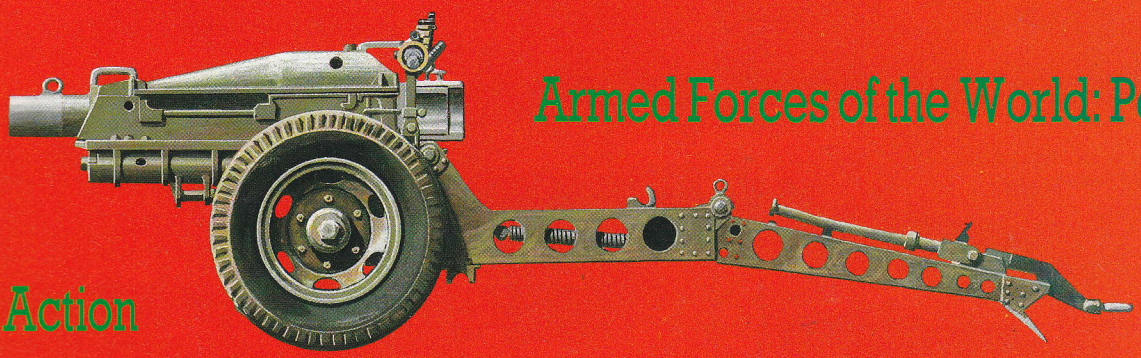

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A fully illustrated guide to Infantry Support Weapons of World War II

WAR MACHINE

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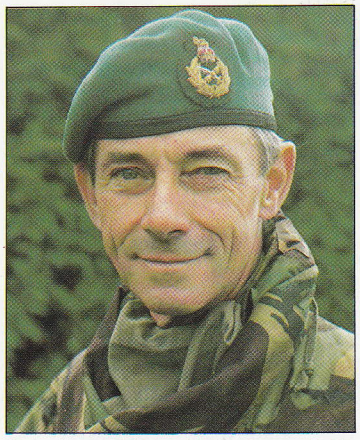

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Infantry Support Weapons of World War II

In the mobile battlefields of World War II, infantry could not count on any artillery unit to be close enough to give support in case of trouble. One solution to the problem was to give the infantry their own artillery, but the most cost-effective method depended upon a weapon as old as gunpowder – the mortar.

Waffen SS infantry in action use a 10-cm Nebelwerfer 35. Originally intended to be a smoke-laying mortar, this weapon had a calibre of 105 mm (4.13 in) and was an enlarged version of the orthodox 8-cm Granatwerfer 34. It was often used to fire HE bombs as well as smoke.

Throughout World War II the standard infantry support weapon used in most armies was the mortar. Some armies tended to combine the light weight and plunging fire of the mortar with the more direct approach and heavier firepower of the infantry gun or howitzer, and there were even some infantry support weapons (such as the odd little Japanese Type 92 battalion gun) that could be said to combine the attributes of gun and mortar. One factor that will be seen to be important throughout this study is the number of really small-calibre mortars that were used during World War II. These lightweight mortars were used right down to infantry squad level, enabling the squad to provide its own local fire support. This was a form of weapon that rose to prominence during World War II, for although the mortar was evolved during World War I it never reached the level of control that could extend right down to the individual squad. This concept has been maintained since 1945, and today provides the infantry with a powerful extension of its offensive and defensive range.

One weapon that rose to prominence during World War II but has faded out since is the infantry gun or howitzer. In the aftermath of World War I it seemed to be a good idea to many armies to provide their infantry units with integral artillery fire support, but providing the infantry with special artillery weapons was rather extravagant in resources and manpower. The artillery piece has never been a true infantry weapon, for it is far too demanding in handling manpower, however small and light it is made. Even before the end of World War II the heavy mortar was replacing the infantry gun, and since 1945 the infantry gun has faded completely from the modern tactical scene. The mortar is now the dominant infantry support weapon, supplemented here and there by recoilless weapons and missiles, but infantry seem to prefer the mortar overall. The weapon was, and still is, portable, has range and firepower to a degree that the soldiers of World War I could not have imagined, and remains completely under the control of the infantry that it supports, just as it did during World War II.

June 1941, and a German mortar crew operate their 8-cm schwere Granatwerfer 34 out of a Soviet farmyard. German mortar crews were extremely well trained, and could provide accurate and rapidly-aimed fire on the request of the infantry, forward observers giving full target information.

USSR

Soviet light mortars

The Red Army used mortars of all kinds in great numbers throughout World War II. In general they were sound and reliable weapons that were usually much heavier than their counterparts elsewhere, but were correspondingly very robust.

During the 1930s the Soviet arms designers closely followed trends elsewhere, and thus developed several types of light infantry mortars with a calibre of 50 mm (1.97 in). After dealing for a short while with one design that could be used as a 37 mm (1.46 in) barrel for a weapon that could also be used as an entrenching tool, the main models settled down into a series that commenced with the **50-PM 38**, designated **5-cm Granatwerfer 205/1(r)** by the Germans. This was a conventional design that used gas vents at the base of the barrel to vary the range; the barrel was held in its bipod at either of two fixed angles. This model soon proved difficult to produce, so it was replaced by the **50-PM 39**, or **5-cm Granatwerfer 205/2(r)** to the Germans, which omitted the gas vent feature and used instead normal bipod elevation methods. While this model was effective enough, it was still thought to be too difficult to produce and was in its turn replaced by the **50-PM 40**. This was designed for mass production on a grand scale and the bipod legs and baseplate were simply pressed steel components. The bipod had a simple and novel method of barrel levelling and in service it proved reliable and useful, even though the range was somewhat restricted. There was one further model in this calibre, the **50-PM 41**, or **5-cm Granatwerfer 200(r)** to the Germans, that dispensed with a bipod and used instead a barrel yoke attached to a large baseplate. A gas venting system was also used, but not many were made as production concentrated on the 50-PM 40. Many of the 50-PM 40s produced fell into German hands and they too used them on a large scale under the designation **5-cm Granatwerfer 205/3(r)**.

While the 50-mm mortars were used at company or squad level, the battalion mortars had a calibre of 82 mm (3.228 in). There were three models in this family, the **82-PM 36** which was a direct copy of the Brandt mle 27/31 and known to the Germans as the **8.2-cm Granatwerfer 274/1(r)**, the **82-PM 37** which was a revised model with recoil springs to reduce firing loads on the bipod and designated **8.2-cm Granatwerfer 274/2(r)** by the Germans, and the **82-PM 41**. The last was a much revised model that made extensive use of stampings to ease production, and was called the **8.2-cm Granatwerfer 274/3(r)** by the Germans. The short bipod was so arranged that wheels could be added to the ends for hand-towing, and this feature was taken one step further with the **82-PM 43**, which used an even simpler bipod to ease towing, one that is still in use today.

There remains one further 'light' mortar to mention. This was a specialized 107-mm (4.21-in) mountain warfare mortar known as the **107-PBHM 38**, or **10.7-cm Gebirgsgranatwerfer 328(r)** to the Germans. It was an enlarged version of the 82-PM 37, and was used with a light limber for horse traction. Alternatively the mortar could be broken down into loads for pack transport. Firing could be by the normal 'drop' method or by means of a trigger. This mountain version saw extensive use during World War II and it is still in use to this day, not only with the Soviet army but with many nations under Soviet influence.

The Soviet 82-PM 37 had a calibre of 82 mm (3.228 in) and was a close design relative of the French Brandt mortars. The Soviets introduced a circular baseplate and used recoil springs between the bipod and barrel to reduce recoil forces on the laying and sighting arrangements.

Specification

50-PM 40
Calibre: 50 mm (1.97 in)
Lengths: barrel 0.63 m (24.8 in); bore 0.533 m (20.98 in)
Weight: in action 9.3 kg (20.5 lb)
Elevation: 45° or 75° fixed
Traverse: 9° or 16°
Maximum range: 800 m (875 yards)
Bomb weight: 0.85 kg (1.874 lb)

82-PM 41
Calibre: 82 mm (3.228 in)
Lengths: barrel 1.32 m (51.97 in); bore 1.225 m (48.23 in)
Weight: in action 45 kg (99.2 lb)
Elevation: +45° to +85°
Traverse: 5° to 10° variable
Maximum range: 3100 m (3,390 yards)
Bomb weight: 3.4 kg (7.5 lb)

107-PBHM 38
Calibre: 107 mm (4.21 in)
Lengths: barrel 1.57 m (61.8 in); bore 1.4 m (55.12 in)
Weight: in action 170.7 kg (376 lb)
Elevation: +45° to +80°
Traverse: 6°
Maximum range: 6314 m (6,905 yards)
Bomb weight: 8 kg (17.64 lb)

USSR

120-HM 38

The Soviet **120-HM 38** is one of the success stories in mortar design, for it was first introduced into service in 1938 and it is still in widespread service to this day. It offered an excellent combination of bomb weight, mobility and range. When first introduced it was as a 120-mm (4.72-in) regimental mortar for producing fire support in place of artillery, and as World War II continued it was issued down to battalion level.

In design terms there was nothing really remarkable regarding the 120-HM 38. One feature that proved to be very useful was the large circular baseplate that allowed rapid changes in traverse without the usual need to dig out the baseplate and align it to the new direction of fire. The weapon was towed with the baseplate still attached with the weapon lying on a wheeled frame. A lunette was fitted into the muzzle and this was attached to the same limber as the 107-PBHM 38. Usually this limber incorporated an ammunition box holding 20 rounds, and the combination was towed either by a light vehicle or a team of horses. Getting the 120-HM 38 in and out of action was relatively rapid and easy, so after fire had been opened it was usually a simple matter to move off again before retaliatory fire started.

As the Germans moved across the USSR in 1941 and 1942 they were much impressed by the firepower of the 120-HM 38. Being on the receiving end of the weapon's efficiency on many occasions, they had good reason to note the power of the bomb's warhead and they decided to adopt the design for themselves. In the short term they simply used as many captured examples as they could, under the designation **12-cm Granatwerfer 378(r)**, but they then went one better and copied the design exactly for production in Germany. This was known to them as the **12-cm Granatwerfer 42 (12-cm GrW 42)** and it was widely issued, even taking the place of infantry guns with some infantry formations. Thus the same weapon was in use on both sides during the fighting on the Eastern Front.

The usual bomb fired by the 120-HM 38 on both sides was the HE round, but smoke and chemical rounds were produced (although thankfully the latter were never used). The rate of fire could be as high as 10 rounds per minute, so a battery of four of these mor-

A Red Army mortar battery uses 120-HM 38s in action in the Caucasian hills during September 1942. The layer is using the mortar's simple sight to lay the mortar while the ammunition crew members stand by to load the heavy HE bombs.

tars could lay down considerable amounts of fire in a very short period. Over a period of action the baseplates did have a tendency to 'bed in', making relaying necessary, but this was partially eliminated by introduction of the **120-HM 43** which used a spring-loaded shock absorber on the barrel-bipod mounting. It is this version, which was otherwise unchanged from the original, that is most likely to be encountered today. Over the years some changes have been made to the ammunition, which now has a longer range than the wartime equivalent, and another change is that many modern versions are now carried on various types of self-propelled carriage.

Specification
120-HM 38
Calibre: 120 mm (4.72 in)
Lengths: barrel 1.862 m (73.3 in); bore 1.536 m (60.47 in)
Weight: in action 280.1 kg (617 lb)
Elevation: +45° to +80°
Traverse: 6°
Maximum range: 6000 m (6,562 yards)
Bomb weight: HE 16 kg (35.3 lb)

Left: The Soviet 120-HM 38 was one of the most successful mortar designs of World War II, and was even copied direct by the Germans for their own use. It combined heavy firepower and mobility and often replaced support artillery with some formations. It was simple and easy to use in action, and fired a heavy HE bomb.

Above: The 120-HM 38 is seen on its wheeled travelling carriage, from which the mortar could be rapidly and easily emplaced. The wheeled carriage was often coupled to a limber that carried some ammunition. So successful was this mortar design that it is still in production.

UK

Ordnance, ML 2-inch Mortar

The first of the British 2-in (50.8-mm) mortars appeared in 1918, but it was not in service for long being rendered obsolete in 1919. It was not until the 1930s that the notion of reintroducing a light mortar for use at platoon or squad level was put forward, and as there was no 'history' of the development of such small mortars in the UK at that time it was decided to run a selection competition between the offerings from various armaments manufacturers. The result was a flood of models from a number of concerns, and after a series of trials one was selected.

The winner was a design from the Spanish manufacturer ECIA. In its original form this weapon was thought suitable for improvement, and the extra further work was carried out in the UK, leading to full production during 1938. The first production version was the **Ordnance, ML 2-inch Mortar Mk II** (ML for muzzle loading), but this was only the first of a long string of marks and sub-marks. In basic terms there were two types of 2-inch Mortar. One was the pure infantry version, which was a simple barrel with a small baseplate and a trigger mechanism to fire the bomb after loading. The second type was meant for use on Bren Gun or Universal Carriers and had a much larger baseplate and a more complicated aiming system. If required the carrier version could be dismounted for ground use and a handle was supplied for this purpose. However, between these two types there were at the least 14 different variants, with differences in barrel length, sighting arrangements and production variations. There were even special versions for use by the Indian Army and by airborne divisions.

To go with this array of weapon variations there was an equally daunting range of types of ammunition. The usual bomb fired by the 2-inch Mortar was HE, but smoke and flares were also fired, the latter being particularly useful for target illumination at night. Having a trigger firing mechanism the weapon could be used at angles close to the horizontal, a factor that was particularly useful in house-to-house combat. The bombs were normally carried in tubes, each holding three, and arranged in handy packs of three tubes. The normal 2-inch Mortar team consisted of two men, one carrying the mortar and the other carrying the ammunition.

The 2-inch Mortar is still around. The British army uses it for firing flares and other pyrotechnics pending the service debut of the new Light Mortar, and many other nations keep the weapon 'on the books'. These days the only version likely to be encountered is the infantry model with its small baseplate, the carrier version having long since passed away.

Specification
2-inch Mortar Mk II***
Calibre: 2 in (50.8 mm)
Lengths: barrel 0.665 m (26.2 in); bore 0.5065 m (19.94 in)
Weight: 4.1 kg (9 lb)
Maximum range: 457 m (500 yards)
Bomb weight: HE 1.02 kg (2.25 lb)

A drill book demonstration of the loading of a 2-inch Mortar. As the loader drops the bomb into the muzzle, he taps the firer on the back to order him to pull the trigger lever via a cord lanyard. The model is the Carrier version with the large baseplate.

A 2-inch Mortar team of the Royal Scots Fusiliers in action during late June 1944 during an attack on Norrey-en-Bessin. The small size of the mortar means that most of it is hidden behind the mortar gunner, demonstrating how easy the mortar was to conceal and use in action at close ranges.

Soldiers of the 1st Battalion, The Hampshire Regiment, in action in Sicily in 1943, using a 2-inch Mortar. The mortar gunner is operating the trigger lever at the base of the barrel to actually fire the bomb while his partner observes the fall of the bomb.

UK

Ordnance, ML Mortar, 3 inch

The first 3-in (76.2-mm) mortar was the original Stokes Mortar that was first used in March 1917. This version remained in use for many years after World War I, and as funds for weapon development were sparse between the wars it remained in service virtually unchanged for some years. However there was some work carried out on the basic design to the point at which it was decided during the early 1930s that the **Ordnance, ML Mortar, 3 inch** would be the standard infantry support weapon. This was the **Mortar, 3 inch Mk II**, the weapon that was used by the army when World War II broke out in September 1939. This Mk II had numerous changes from the original World War I Mk I, especially in the ammunition which used many of the features of the French Brandt design innovations.

It was not long after the start of the war when it was noticed that although the Mk II was a sturdy and reliable weapon, it lacked the range of many of its contemporaries. The early versions had a range of only some 1463 m (1,600 yards), which compared badly with the 2400 m (2,625 yards) of its German equivalent, the 8-cm GrW 34. A long series of experiments and trials using new propellants increased this range to 2515 m (2,750 yards), which overcame many of the original drawbacks, but these new propellants took time to get into the hands of front-line troops, so at times many German and Italian mortars were used by British troops, especially during the North African campaigns.

Apart from the ammunition changes other alterations were made to the basic design. Later marks were equipped with a new baseplate design and improved sighting arrangements, and there was even a special version (Mortar, 3 inch Mk V) developed for use in the Far East, but only 5,000 of them were made and some were used by the airborne divisions. The usual method of getting the weapon into action was pack carriage in three loads by men, but the mechanized battalions carried their weapons on specially-equipped Universal Carriers. On these the mortar was carried on the back of the vehicle ready to be assembled for normal ground use; it was not fired from the Carrier. The Carrier also had stowage for the ammunition. When dropped by parachute the barrel and bipod were dropped in one container. Another container carried the baseplate while yet another container held the ammunition.

The ammunition for the family was largely confined to HE and smoke, although other payloads such as illuminants were developed. By juggling with the propelling charge increments and barrel elevation angles it was possible to drop a bomb as close as 114 m (125 yards) away, a useful feature in close-quarter combat.

Somehow the weapon never achieved the respect that was given to its opponents, but once the original range shortcomings had been rectified it proved to be a sound enough weapon that remained in service with the British army until the 1960s. It is used by some of the smaller ex-Commonwealth armies.

The 3-inch Mortar was the standard infantry support weapon of the British and Commonwealth armies in World War II, but it generally lacked range compared to weapons in service elsewhere. During the war gradual ammunition changes improved the range, and the 3-inch Mortar was a handy and popular weapon in action.

Specification
Mortar, 3-inch Mk II
Calibre: 3 in (76.2 mm)
Lengths: overall 1.295 m (51 in); barrel 1.19 m (46.85 in)
Weight: in action 57.2 kg (126 lb)
Elevation: +45° to +80°
Traverse: 11°
Maximum range: 2515 m (2,750 yards)
Bomb weight: HE 4.54 kg (10 lb)

Soldiers of the Black Watch are seen in action with their 3-inch Mortar near Herouvillette in Normandy during June 1944. The mortar is carefully emplaced in a purpose-dug pit, with adequate space for the mortar and crew and with camouflage netting handy for concealment.

A British 3-inch Mortar team provides fire support against German positions across the River Maas during the bitter weather of January 1945. This team appears to have a lengthy fire mission, judging from the pile of mortar bomb containers stacked ready to hand.

UK

Ordnance, SB 4.2-inch Mortar

By 1941 it was noted by British army staff planners that there was a need for a mortar that could fire projectiles producing large amounts of tactical smoke for screening and other purposes; no doubt they had been influenced by the 10-cm Nebelwerfer mortars of the German Nebeltruppen. Accordingly a new design of 4.2-in (106.7 mm) heavy mortar was developed, but almost as soon as the first examples were ready for issue to Royal Engineer smoke production units the requirement was changed to convert the new weapon into a heavy mortar firing conventional HE bombs for issue to Royal Artillery batteries. Thus the new mortar became the **Ordnance, SB 4.2-inch Mortar** (SB for smooth-bored).

The 4.2-inch Mortar was produced at a time when the British defence industry was fully stretched and production facilities of all kinds were in short supply. This was particularly noticeable in the production of the bombs, for the designers wanted them to have forged bodies to reduce weight and to produce a better ballistic shape. At that time the required forging facilities were not available, so the bomb bodies had to be cast. This resulted in a maximum range of only 3018 m (3,300 yards) as opposed to the required 4023 m (4,400 yards). These bombs had to be used for they were all that could be made at the time pending the introduction of a new design with a streamlined body. Again, these had to be manufactured using cast iron but they did manage a range of 3658 m (4,000 yards). By that time HE bombs were the main projectile used, but the original smoke function had not been entirely forgotten and some smoke bombs were produced.

The 4.2-inch Mortar was fairly hefty to move around, so the usual method of getting it into action was to tow it using a Jeep or other light vehicle. The baseplate and the barrel/bipod were so arranged that they could be easily lifted up onto a small wheeled mount-

ing. Once on site they could be lowered from the mounting and the barrel and bipod quickly assembled. When carried on a Universal Carrier things were even simpler. The baseplate was simply dropped off the back, the barrel was inserted and the bipod shoved into place, and firing could start almost at once. Getting out of action was just as rapid. This led to the 4.2-inch Mortar being viewed with some suspicion by the troops that relied upon its firepower support. While they valued its supporting fire they knew that as soon as a 4.2-inch Mortar battery was brought into action nearby it would be off again before the incoming counterbattery fire from the enemy arrived. By that time the 4.2-inch Mortar battery would be some distance away, leaving the units close to their former position to receive the fire meant for the battery.

The 4.2-inch Mortars were widely used by the Royal Artillery, many field regiments having alternative gun or 4.2-inch Mortar complements. The 4.2-inch Mortar was used wherever British troops served from late 1942 onwards, and the weapon was still in use during the Korean War, in which it was used to tackle targets situated on reverse slopes behind hills or in valleys.

Specification
4.2-inch Mortar
Calibre: 106.7 mm (4.2 in)
Lengths: barrel 1.73 m (68.1 in); bore 1.565 m (61.6 in)
Weight: in action 599 kg (1,320 lb)
Elevation: +45° to +80°
Traverse: 10°
Maximum range: 3749 m (4,100 yards)
Bomb weight: 9.07 kg (20 lb)

A 4.2-inch Mortar fires on German positions in the foothills of Mount Etna in Sicily during 1943. The crew are protecting their ears against the considerable muzzle blast. The amount of dust stirred up could reveal a mortar position in action.

UK

95-mm Infantry Howitzer Mk II

At some point during 1942 a decision was made to produce a light howitzer for use by British infantry battalions but at that time the infantry themselves had not been consulted: perhaps the planners were influenced by the use of infantry artillery in nations such as Germany and the USA. In order to conserve production facilities it was decided that the new weapon would incorporate features from a number of existing weapons. The barrel was to be machined from a 94-mm (3.7-in) anti-aircraft gun liner, the breech mechanism would come from the 25-pdr field gun and the recoil system and cradle came from 6-pdr anti-tank gun components. To simplify matters the new weapon would fire the same ammunition as the old 3.7-inch Pack Howitzer and the close-support howitzers fitted in some tanks. The term **95-mm Infantry Howitzer** was applied to the project, 95 mm denoting the differences from other similar weapons.

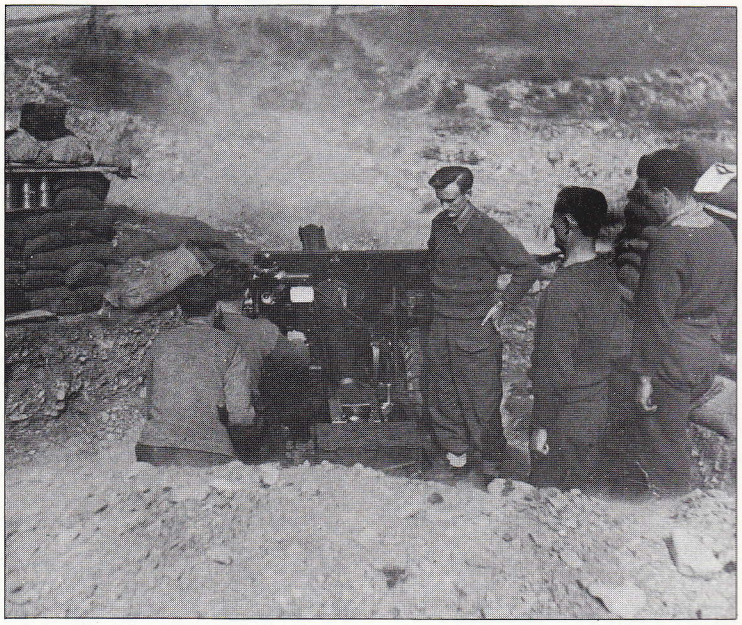
The 95-mm Infantry Howitzer was not one of the success stories of World War II. The resultant amalgamation of components from various weapons allied to a new welded steel box carriage looked rather odd, and so it turned out to be once it was fired. The 6-pdr recoil system was simply not up to the task of absorbing the recoil loads and frequently broke. The wheel track also proved to be too narrow, leading to tow instability. Prolonged firing also showed that the overall construction of the weapon, designed for pack transport in 10 loads, was such that components could be shaken loose. No doubt more development could have eliminated many of these defects, but by the time they emerged the weapon was already in production.

It was at this point that the infantry were drawn into the programme. They quickly announced that they did not want the weapon. They had not been consulted at any stage and considered that they already had quite enough weapon types within their battalions, and there simply was not enough manpower to deal with a howitzer as well. This finally killed off the 95-mm Infantry Howitzer project altogether, and the majority of the numbers produced were never even issued. They were simply scrapped after the war and today only one remains.

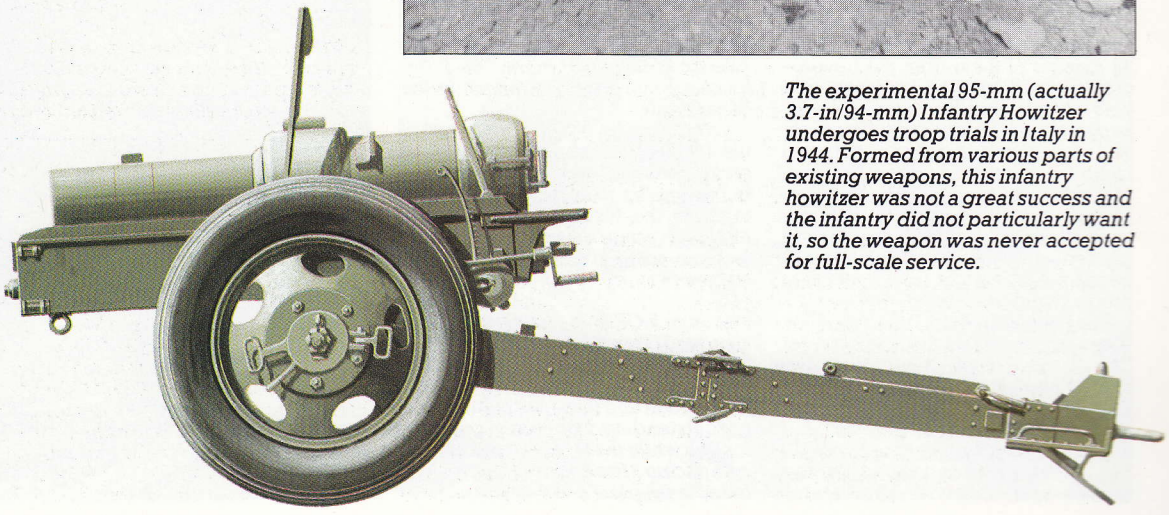
Only two projectiles were produced for use with this weapon, HE and smoke. There were plans for an anti-tank HEAT projectile, but that was an offshoot of the 95-mm tank howitzer programme, and mention can be found of a flare shell. These projectiles were to be fired using a three-charge system.

The entire 95-mm Infantry Howitzer project now seems almost like a textbook example of how not to go about weapon design. No doubt the weapon could have been developed to the point of serviceability, but the recoil system was such a source of troubles that it now seems doubtful if it would ever have worked properly. Perhaps the biggest mistake in the entire project was going ahead with design and development without even troubling to find out if the intended operator really wanted the final product.

Specification
95-mm Infantry Howitzer
Calibre: 94 mm (3.7 in)
Lengths: barrel 1.88 m (74.05 in); bore 1.75 m (69 in)
Weight: in action 954.8 kg (2,105 lb)
Elevation: −5° to +30°
Traverse: 8°
Muzzle velocity: 330 m (1,083 ft) per second
Maximum range: 5486 m (6,000 yards)
Projectile weight: 11.34 kg (25 lb)



The experimental 95-mm (actually 3.7-in/94-mm) Infantry Howitzer undergoes troop trials in Italy in 1944. Formed from various parts of existing weapons, this infantry howitzer was not a great success and the infantry did not particularly want it, so the weapon was never accepted for full-scale service.



The British 3.7-in (94-mm) howitzer was meant to be a mountain weapon when it was first introduced during World War I, but was later used as a light pack howitzer in World War II.

ITALY

45/5 modello 35 'Brixia'

To the little **45/5 modello 35 'Brixia'** must go the prize for being the most overdesigned and overengineered mortar of World War II. Quite why the designers of the modello 35 went to such lengths to introduce needless complexities to a light support mortar with a very limited performance and a relatively ineffective projectile is now difficult to fathom, but the result was issued to the Italian armed forces in large numbers.

In this weapon's designation the term 45/5 indicates the calibre of 45 mm (1.77 in) and the length of the barrel in calibres, i.e. 5×45 mm (actually it was marginally longer). Such a small calibre could encompass only a small bomb that weighed a mere 0.465 kg (1.025 lb), with a correspondingly small explosive payload. The barrel was breech-loaded: operating a lever opened the breech and closing it fed a propelling cartridge from a magazine holding 10 cartridges. A trigger was used to fire the bomb, and to vary the range a gas port was opened or closed to vent off some of the propellant gases. If this was not enough there were also complex elevation and traverse controls.

The barrel of the modello 35 was located in a folding frame arrangement that rested against a carrier's back using a cushion pad to ease the load against the body. In use this frame was unfolded in such a way that the firer could then sit astride the weapon if required. In action the modello 35 could manage a fire rate of up to about 10 rounds per minute, and in trained hands the weapon was quite accurate. But even when they landed right on target the small bombs were relatively ineffective, mainly as a result of the small payload that often resulted in erratic and ineffective fragmentation.

The modello 35 was widely used by the Italian armed forces, mainly at platoon level. All Italian soldiers were trained in its use, some of them while still in one or other of the Italian youth movements, which were issued with an equally complex but even less effective version of the modello 35, this time in 35-mm (1.38-in) calibre. These weapons were meant only for training, usually firing inert bombs.

The Italians were not the only users of the modello 35. There were times during the North African campaigns when the Afrika Korps found itself using the things, usually for logistical reasons when serving alongside Italian formations. There was even an instruction manual written in German for this very purpose, the German designation of the weapon being **4.5-cm Granatwerfer 176(i)**.

It seems almost certain that the Italian soldiers found to their cost the limitations of the modello 35 and retained the weapon in service for the simple reason that there was little chance of Italian industry being able to produce anything better in the then foreseeable future. Having expended so much development time and production effort into getting the modello 35 into the hands of the troops, the limited ability of the Italian defence industries would have required too much time to design, develop and produce yet another weapon. So the Italian soldiers simply had to make do with what they were given; no doubt many of them thought it was not much.

The Italian 45/5 modello 35 'Brixia' mortar was one of the most complicated mortar designs ever produced. It used a lever-operated breech mechanism and fired tiny 0.465-kg (1.025-lb) bombs.

Specification

45/5 modello 35
Calibre: 45 mm (1.77 in)
Lengths: barrel 0.26 m (10.2 in); bore 0.241 m (9.49 in)
Weight: in action 15.5 kg (34.17 lb)
Elevation: +10° to +90°
Traverse: 20°
Maximum range: 536 m (586 yards)
Bomb weight: 0.465 kg (1.025 lb)

GERMANY

5-cm leichte Granatwerfer 36

German weapon designers between the world wars were presented with virtually a clean slate on which to work as Germany gradually rearmed during the early 1930s. Thus when a requirement was issued for a light infantry mortar for issue at squad level, the designers at Rheinmetall-Borsig AG decided not to follow the usual barrel/baseplate/bipod form but instead evolved a design in which the barrel was permanently secured to the baseplate and the bipod was virtually eliminated in favour of a monopod device fixed to the baseplate. The result was a rather complex little weapon with a calibre of 50 mm (1.969 in) that was known as the **5-cm leichte Granatwerfer 36** or **leGrW 36** (light grenade-launcher model 1936) that was first issued for use during 1936.

The leGrW 36 was in many ways a prime example of the German's general love of gadgetry in weapons. It had all manner of them from the traverse controls built onto the baseplate to a very complicated but completely unnecessary telescopic sight. This sight was very much a designer's attempt to make the weapon as perfect as possible and ensure accuracy, but the ranges at which the little leGrW 36 was used were such that a simple line painted on the barrel was all that was needed and the sight soon went out of production during 1938.

The weapon could be carried by one man using a handle on the base of the barrel. For all its small size the leGrW 36 was rather heavy, weighing 14 kg (30.8 lb). Thus in action one man had to carry it, with another carrying the ammunition in a steel box. In action the baseplate was placed on the ground and all barrel adjustments were made using coarse and fine control knobs. Firing was carried out using a trigger. Only HE bombs were fired.

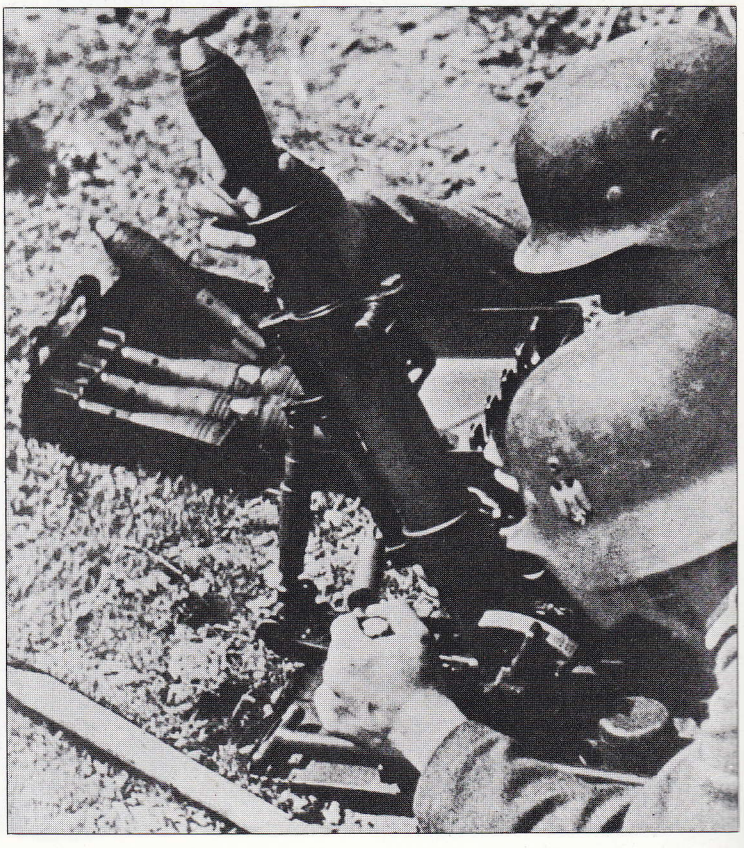
While the designers felt rather proud of their achievement in the leGrW 36, the soldiers were not so enthusiastic. They felt that the leGrW 36, quite apart from the weight problem, was simply too complicated and the bomb not worth all the trouble involved. The bomb weighed only 0.9 kg (1.98 lb) and the maximum range was a mere 520 m (569 yards). On top of this the weapon took time to produce, and was costly in raw material terms and other resources. Such a situation could not last once the war was under way, and by 1941 the leGrW 36 was out of production. Those that had been manufacured were gradually withdrawn from front-line service in favour of something better, being passed on to second-line and garrison units. Many were used by units manning the Atlantic Wall as part of the beach defences. Some were passed on to the Italian army.

Overall the leGrW 36 was not one of the German weapon designers' best efforts. They allowed a small weapon to become far too complex and costly to justify the result, and the German army was astute enough to realize the fact and so went on to employ more useful weapons.

The 5-cm leGRW 36 was one of the standard German army light mortars of the early war years, but it was too complex and expensive for wartime production and its performance was not outstanding. Here one is being loaded while the layer adjusts the complicated fire controls on the heavy base plate and yoke.

Specification

leGrW 36
Calibre: 50 mm (1.969 in)
Lengths: barrel 0.465 m (18.3 in); bore 0.35 m (13.78 in)
Weight: in action 14 kg (30.8 lb)
Elevation: +42° to +90°
Traverse: 34°
Maximum range: 520 m (569 yards)
Bomb weight: 0.9 kg (1.98 lb)



GERMANY

8-cm schwere Granatwerfer 34

The German army's **8-cm schwere Granatwerfer 34** or **8-cm sGrW 34** (heavy grenade-launcher model 1934) gained for itself an enviable reputation among Allied front-line soldiers for its accuracy and rate of fire. The weapon was encountered everywhere the German army was in action, for the sGrW 34 was one of the German army's standard weapons in use from 1939 right through to the last days of World War II. It was a Rheinmetall-Börsig AG product, but was in truth a Germanic revision of the Brandt mle 27/31 and even used the same calibre of 81.4 mm (3.2 in).

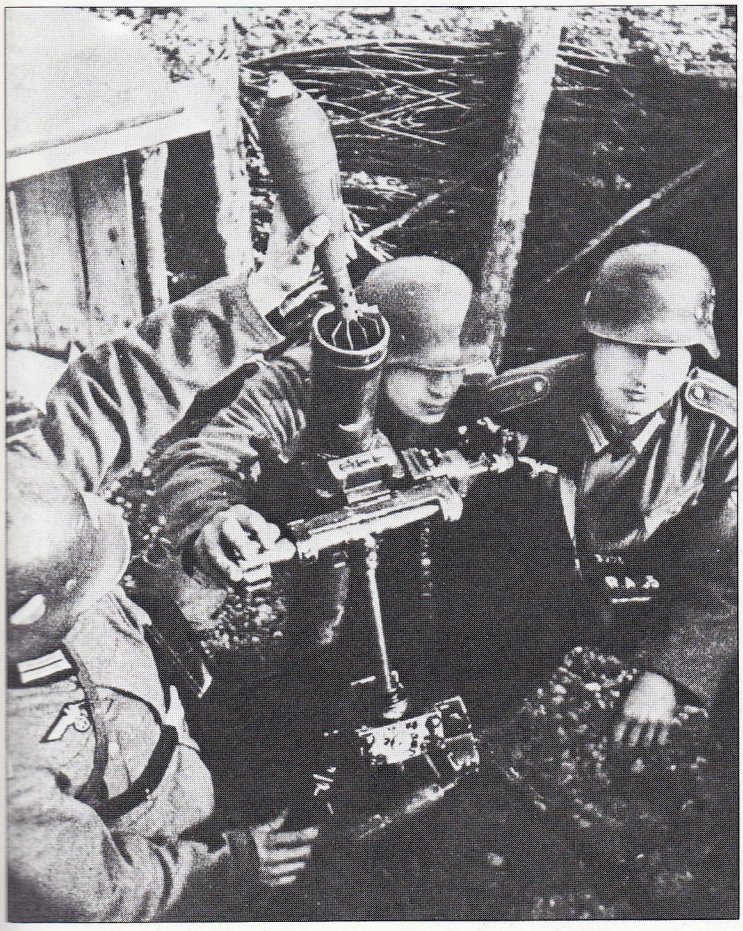
Despite its reputation there was nothing remarkable regarding the design of the sGrW 34. Much of the respect it gained as a weapon should instead have gone to the thorough training and efficiency of the men who used it, for throughout the war the German mortar crews seemed always to have an edge over their rivals. They became experts at getting their sGrW 34s in and out of action rapidly and by careful use of plotting boards and other fire-control aids, they were able to obtain maximum accuracy from their fire.

The sGrW 34 was straightforward in design and very well made. It was consequently very robust and could be broken down into three loads for man-pack carrying; more men had to carry the ammunition. A special version existed for use from SdKfz 250/7 half-tracks. Several centres were concerned with production of the weapon, and even more were involved in making the ammunition for the range of bombs that could be fired from the sGrW 34 was wide. There were the usual HE and smoke bombs, but innovations included illuminating and target-marking bombs for use in association with ground-attack aircraft. There was even a special 'bouncing bomb' known as the 8-cm Wurfgranate 39 that was pushed back up into the air after it had struck the ground. This was done using a tiny rocket motor, and at a predetermined height the bomb exploded to scatter its fragments over a much wider area than would be the case with a conventional ground-detonated bomb. Again, this was a typical German weapon innovation that was really too expensive and unreliable for general use and the numbers produced were never large. One extra bonus for the sGrW 34 was that it could fire a wide range of captured ammunition, although usually with some loss in range performance.

For airborne use a special shortened version of the sGrW 34 was developed in 1940. This was the **kurzer Granatwerfer 42**, usually known as the **Stummelwerfer**. This was issued in quantity from about 1942 onwards, but saw little use by airborne forces and instead became a replacement for the little 5-cm leGrW 36. It fired the same ammunition variety as the sGrW 34 but the range was reduced by more than half.

The German 8-cm sGrW 34 was greatly respected by the Allies, who came to fear its accuracy and rapid rate of fire, but it was not an outstanding design and much of the praise it earned was mainly due to the careful and thorough training of the mortar crews.

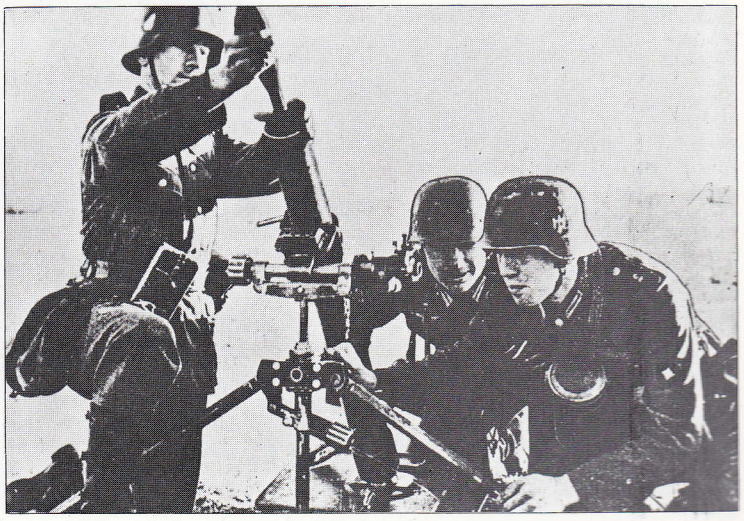
Specification
sGrW 34
Calibre: 81.4 mm (3.2 in)
Lengths: barrel 1.143 m (45 in); bore 1.033 m (40.67 in)
Weight: in action 56.7 kg (125 lb)
Elevation: +40° to +90°
Traverse: 9° to 15° variable with elevation
Maximum range: 2400 m (2,625 yards)
Bomb weight: 3.5 kg (7.72 lb)



The shape of the 8-cm sGrW 34 bomb can be clearly seen here as it is held ready for loading into the muzzle. The bomb weighed 3.5 kg (7.72 lb) and used multiple tail fins to provide stability in flight. The layer is making fine traverse adjustments using the simple sight mounted on the bipod.

Right: A German army 8-cm sGrW 34 crew. The pear-shaped bomb is being introduced into the muzzle to fall down onto the fixed firing pin to fire the propelling charge and propel the bomb to a maximum range of 2400 m (2,625 yards).

Below: A propaganda photograph of an 8-cm sGrW 34 in action, clearly showing the elevation, traverse and levelling controls on the bipod. The crew member on the right is holding the bipod to provide an extra measure of stability on firing.



GERMANY

7.5-cm leichte Infantriegeschütz 18

One of the many tactical lessons learned by the German army during World War I was that each infantry battalion should have a measure of artillery support available to it at all times. This led to the introduction of light infantry guns to each infantry battalion, and it was appreciated that special light guns would be particularly useful for the role. Thus during the 1920s one of the first priorities of the then severely-restricted German weapons industry was the development of a light infantry gun, or leichte Infantriegeschütz. A 75-mm (2.95-in) design was produced by Rheinmetall-Börsig as early as 1927 and was issued for service in 1932. It was usually known as the **7.5-cm leIG 18**, or **7.5-cm leichte Infantriegeschütz 18**.

The first examples had wooden-spoked wheels, while later versions intended for use by motorized formations had metal disc wheels with rubber tyres. The leIG 18 had an unusual breech-loading mechanism: operating a lever opened not the breech but instead moved the entire barrel section upwards in a square slipper to expose the loading chamber. This system was yet another example of German design innovation simply for its own sake, for the mechanism offered no real advantage over conventional systems of the period, and has been used in no artillery design since. The rest of the gun was orthodox enough, and in action it proved to be sturdy and reliable although having only a limited range, as a result mainly of the short barrel. In common with most other artillery designs of the period, the leIG 18 was supposed to have an anti-tank capability using a hollow-charge warhead projectile, but this was not very effective and was little used.

There were two variants of the basic leIG 18. One was a version specially developed for use by mountain warfare units and known as the **leichte Gebirgs Infantriegeschütz 18** or **leGebIG 18** (light mountain infantry gun model 18). This was developed from 1935 onwards and was basically an ordinary leIG 18 that could be broken down into 10 loads for pack transport on mules or light vehicles. To save weight the ordinary box trail was replaced by tubular steel trail legs, and the shield became an optional extra. The leGebIG 18 turned out to be heavier than the original but the pack load feature made it much more suitable for its intended role. It was meant to be a temporary measure for the mountain warfare units until purpose-built mountain guns could be developed and produced, but in the event those produced remained in service until the war ended.

There was also a special version of the leIG 18 developed for airborne forces and known as the **7.5-cm leIG 18F**, the F indicating *Fallschirmjäger*, or parachutist. This could also be broken down into loads, but this time only four for paradropping in special containers. This version had small metal wheels, no shield and tubular trail legs. Only six were produced as by the time they were ready their intended role had been assumed by the recoilless gun.

Specification
leIG 18
Calibre: 75 mm (2.95 in)
Lengths: gun overall 0.9 m (35.43 in); barrel 0.884 m (34.8 in)
Weight: in action 400 kg (882 lb)
Elevation: −10° to +73°
Traverse: 12°
Muzzle velocity: 210 m (689 ft) per second
Maximum range: 3550 m (3,882 yards)
Projectile weight: HE 5.45 kg or 6 kg (12 or 13.2 lb); hollow charge 3 kg (6.6 lb)

A 7.5-cm leIG 18 is loaded, an unusual procedure where operation of the breech lever raised the rear end of the barrel upwards in a slipper to expose the chamber; the breech block remained fixed. This gun has spoked wheels for horse traction, while later models had metal wheels with rubber tyres.

The crew of a 7.5-cm leIG 18 in training during early 1940. Note the relatively small size of the round being handed to the loader, and the way one crew member is kneeling on the end of the trail to provide extra weight for stability on firing.

GERMANY

15-cm schwere Infantriegeschütz 33

When the German army issued its infantry gun requirements during the early 1920s, two types of weapon were requested. One was to be a 75-mm (2.95-in) gun and the other a 15-cm (5.87-in) howitzer to act as a heavier counterpart to the light gun. Development of this heavy weapon commenced in 1927 at a leisurely pace, so that it was not finally approved for service until 1933. Even then it was 1936 before the first examples came off the production lines and they were then issued at the rate of two to each infantry battalion.

To confuse matters somewhat this 15-cm howitzer was actually designated as a gun, i.e. **15-cm schwere Infantriegeschütz 33** or **15-cm sIG 33** (15-cm heavy infantry gun model 1933). It was definitely a howitzer, however, with a short barrel set on a heavy box-trailed carriage. Early examples had pressed steel wheels with metal rims for horse traction, but later examples intended for use with the motorized formations had wheels with rubber rims. Once again Rheinmetall-Börsig was responsible for the basic design (although production was carried out by several other manufacturers), and for once no gimmicks were introduced, the design of the sIG 33 being straightforward and orthodox. If anything it was too orthodox for the infantry gunners, for the adherence to standard design meant that the sIG 33 was really too heavy for the infantry role. It required a large horse team to drag the weapon, and once the sIG 33 was emplaced it was a slow and hard task to move it out. Some attempts were made before 1939 to lighten the heavy carriage by the use of light alloys, but these were in overall short supply and earmarked for the Luftwaffe so the heavy design had to be tolerated.

Throughout the war most sIG 33s were towed by horse teams, although trucks or halftracks were used whenever possible. Even with a tractor it was still a job to handle the weapon in action, and it was not until the sIG 33 was placed upon a tracked self-propelled chassis that the weapon could give its full potential. It was then much more appreciated as a powerful support weapon firing a wide array of projectiles. Most of the tracked chassis used for the self-propelled role were old tank chassis that were no longer large or powerful enough for armoured warfare; in fact the very first attempt to mount a sIG 33 on a PzKpfw I hull resulted in the very first German self-propelled artillery weapon, and this was used during the 1940 campaign in France.

As with all other weapons of its era, the sIG 33 was supposed to have an anti-tank capability and was accordingly issued with hollow-charge projectiles. In use these proved to be less than fully effective, for even a normal 150-mm HE shell striking a tank could be effective and a lot less trouble to manufacture and issue. But for really strong targets the sIG 33 could fire a muzzle-loaded stick bomb known as a Stielgranate 42. This had only a short range and was guided by fins towards its target, which was usually a blockhouse, bunker or some other strongpoint.

Specification
sIG 33
Calibre: 149.1 mm (5.87 in)
Length: barrel 1.65 m (64.9 in)
Weight: in action 1750 kg (3,858 lb)
Elevation: 0° to +73°
Traverse: 11.5°
Muzzle velocity: 240 m (787 ft) per second
Maximum range: 4700 m (5,140 yards)
Projectile weight: HE 38 kg (83.8 lb)

The sIG 33 in Action

In 1917 the German army re-introduced light artillery to the infantry battalions, significantly increasing their firepower and tactical flexibility. These battalion guns were so successful that the post-war German army ordered a series of purpose-built weapons which were to serve them well in World War II, although their function was eventually usurped by heavy mortars.

During the years after World War I the small general staff of what was allowed to remain of the German army carried out a great deal of what is now termed tactical analysis, using the mass of reports and other data collected during the battles of the 'Great War'. Out of these patient siftings came many indications of future tactics and of the direction weapon design should follow, and in nearly every case something was done to implement these findings. One conclusion that was followed up was the need for the infantry battalion to have its own integral artillery fire support, the manpower to handle these weapons coming from within the battalion itself. This would enable the infantry battalion to supply some measure of its own fire support outside that usually provided by artillery batteries, and with some measure of speed of response that remote batteries could not always supply.

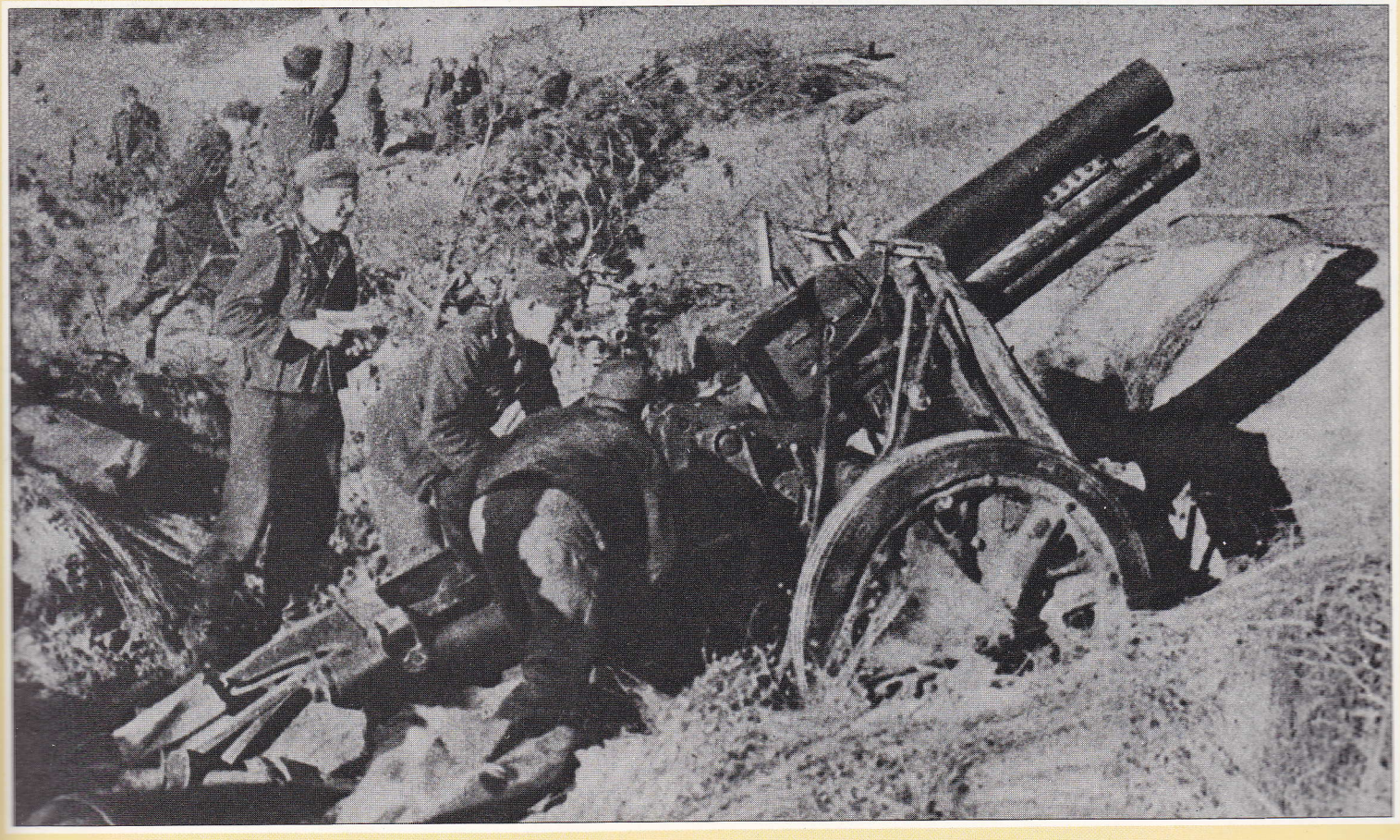
Two weapons were requested. One was a 75-mm (2.95-in) gun, while the other was to be a heavier howitzer with an undetermined calibre. At that period, in the wake of the Versailles Treaty, the only armaments concern that could deal with the request was Rheinmetall-Börsig AG of Düsseldorf, Krupp being forbidden to produce small-calibre artillery weapons under the terms of the treaty. Rheinmetall decided to produce an entirely orthodox howitzer, but as the size was still uncertain prototypes were to be produced with calibres of 105 mm (4.14 in), 150 mm (actually 149.1 mm/ 5.87 in) and 210 mm (8.27 in). Only the latter two prototypes were actually made, and when the staff planners saw the bulk and weight of the intended weapons decided to go for the 150-mm version.

That was in 1927, and production began at a slow pace. This howitzer was not formally accepted for service until 1933, and it was 1936 before the troops actually laid their hands on the first examples. Much of this delay was caused by the priority given to other weapon programmes by the planners and by the fact that there were some reservations regarding the weight of the chosen design. At one point some consideration was given to the possibility of a split-trail carriage, but in the end the original box trail design was adopted. The weapon was designated the 15-cm schwere Infantriegeschütz 33, or 15-cm sIG 33.

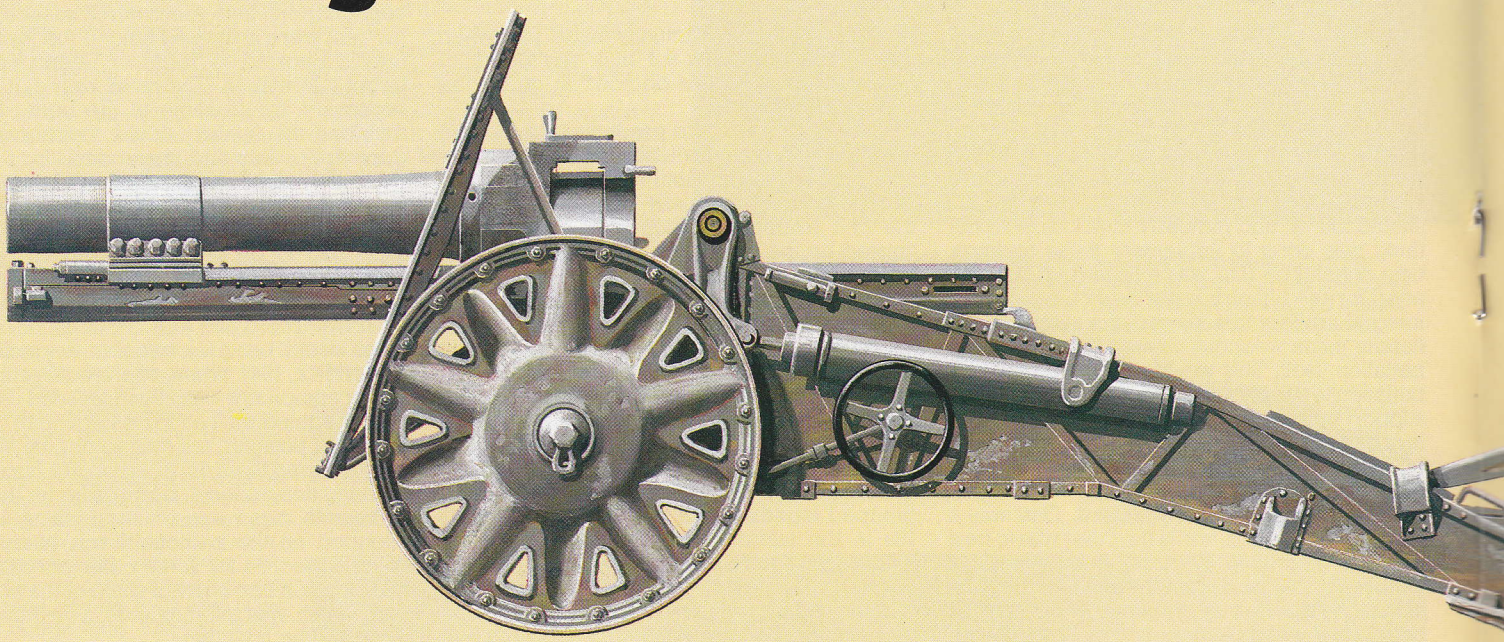
The 15 cm sIG 33 was allocated to German army infantry divisions. There they were grouped together with the smaller 7.5-cm IG 18s in the infantry howitzer company, often known within the division as the 13th Company. Within this company the 4th Platoon (or Zug) was equipped with two sIG 33s. The platoon was commanded by a junior officer with five NCOs in support. The full platoon complement was 33 men, although this was not always achieved and the numbers varied according to whether the division was mechanized or not. Between them these 33 men formed the manpower to operate the sIG 33s in action. If the division was a horse-drawn formation (which most of them were, especially when the sIG 33 was first issued), each weapon was towed by a team of six horses driven by three men. More men sat on a limber that was used to connect the team to the weapon. Men not with the horses or the guns were used to form a small headquarters and fire-control section, while the rest were scattered among the formations they supported to radio or telephone back target information. The latter were not always necessary, for in some of the better-trained divisions the infantry could themselves produce fire orders and target data.

Once at the firing position the horses were led away to the rear. If the unit was mechanized the type of tractor could vary widely. It was supposed to be one of the various types of halftrack tractors, but in practice these were in such short supply that very often trucks had to be used. The types and condition of some of these could be quite variable, especially by the end of 1941 when captured French and Soviet equipment was in widespread use. This tractor equipment had to be kept quite close to the firing position, not only to get the weapon and the firing team out of action in a hurry if the situation demanded it, but in order for the crew to keep a close eye on it: anything left unattended on the battlefield was likely to be commandeered for some other purpose. The tractor/truck also carried some of the ammunition, which was another reason for keeping it close by the howitzer.

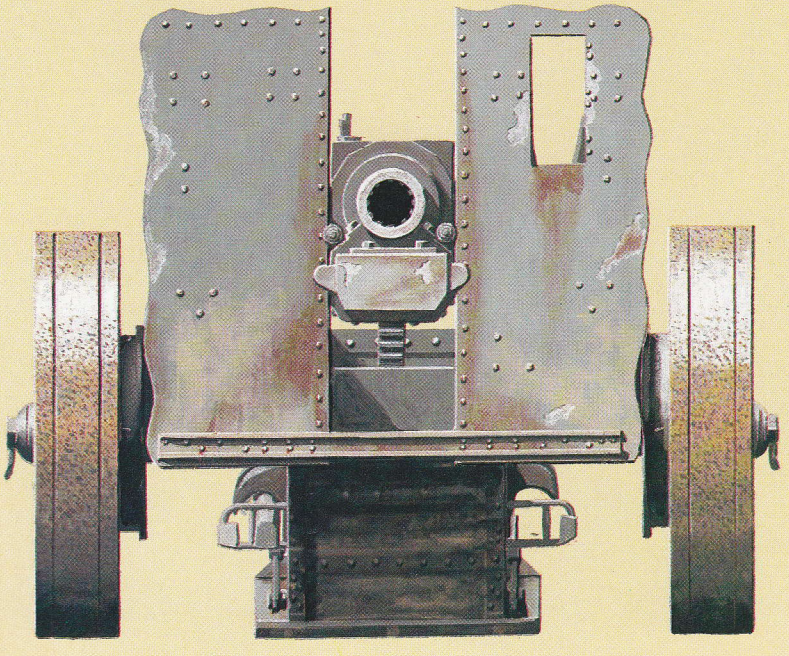
15-cm sIG 33s of a motorized infantry unit are seen in action on the Eastern Front. The wheels of these weapons have rubber tyres, denoting that they were towed by some form of mechanized tractor. The standing soldier on the nearest gun is holding the propellant charge case ready to load behind the shell in the breech.

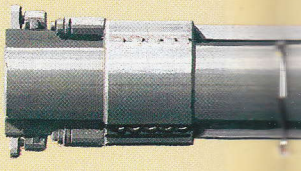


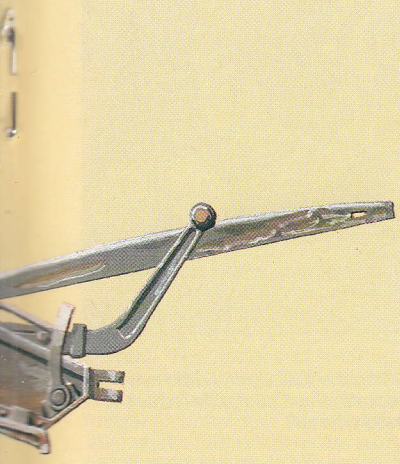
15-cm schwere Infantriegeschütz 33

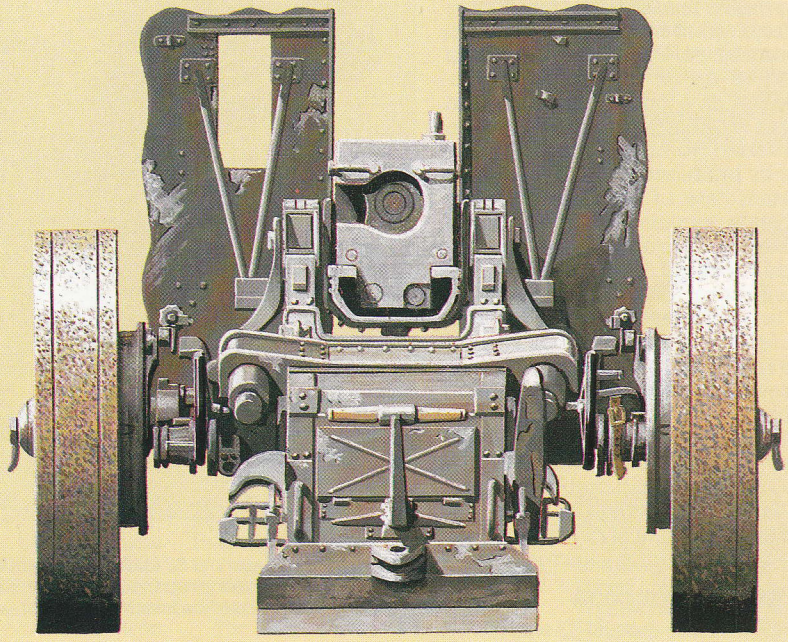


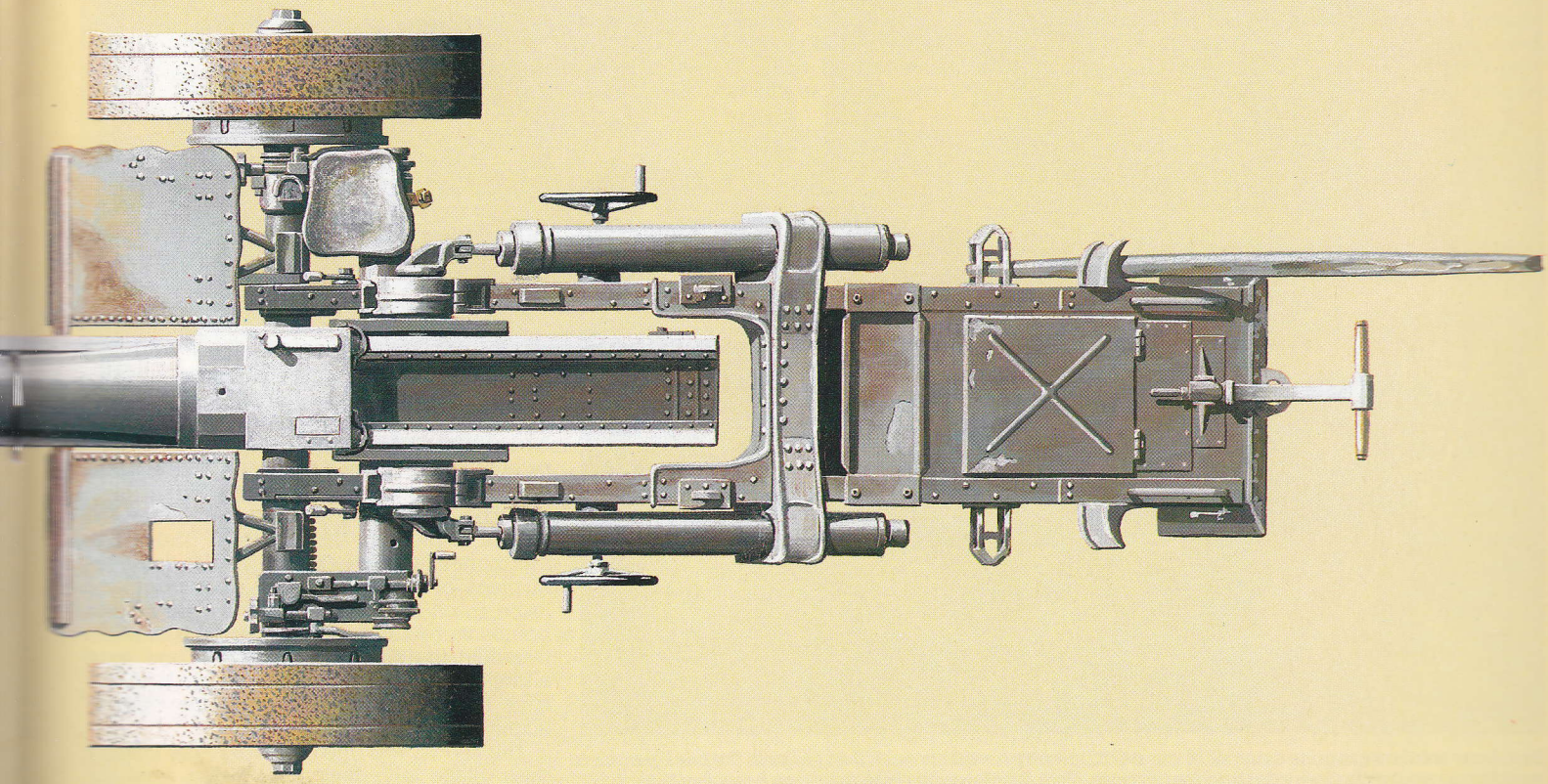
The 15-cm sIG 33 was produced in two main service versions, for horse-drawn traction (shown here) with steel-rimmed metal wheels or for mechanized traction with rubber-tyred wheels. Both types were otherwise similar and were highly efficient and battle-worthy weapons that proved to be too heavy for their infantry role, as they were too bulky to be moved quickly under front-line conditions. In action they had a good range (4700 m/5,140 yards) for most fire support tasks, and fired a useful 38-kg (83.8-lb) HE shell, powerful enough to destroy most battlefield strongpoints.





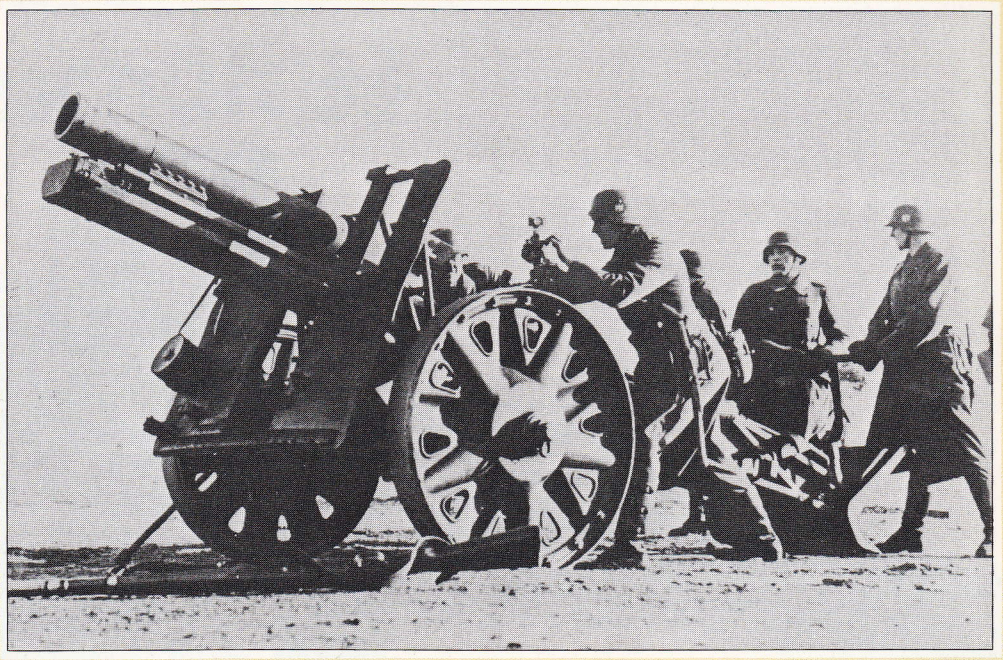






sIG 33 in Action

In the early stages of World War II few of the sIG 33s were used by mechanized divisions, so the horse was the usual method of traction. Getting the sIG 33 in and out of action was thus a hard task, for the weapon usually had to be manhandled over the final stages of positioning which often required the labour of more than the six-man team alone. But once in action the sIG 33 proved to be an excellent weapon. Although labelled as a gun it was actually a howitzer using a six-charge propellant system that could be varied (to suit the range and the type of target) by producing direct or plunging fire. The normal rate of fire was slow but steady: four rounds per minute was considered the norm as the projectile and the charge case had to be loaded by hand. The usual projectile was an HE shell known as the InfantrieGranate 33 or 38, the two differing only in detail. This had a bursting charge of TNT or amatol weighing 8.29 kg (18.28 lb), which was enough to produce a really powerful burst and damage even heavy structures. Smoke projectiles were also fired and for anti-tank use there was a hollow-charge projectile. However, the carriage of the sIG 33 did not lend itself to anti-tank warfare, so these hollow-charge warheads were more often used against concrete structures such as blockhouses or bunkers.



The crew of a 15-cm sIG 33 undergoes training in 1938. The layer is adjusting the dial sight, while two members of the crew prepare to traverse the heavy carriage using a lever over the trail spade (which is not dug in, as it would be in action). This weapon is fitted with steel-rimmed wheels.

Attempted weight reduction

For all its effectiveness the sIG 33 was really too heavy for its infantry-orientated role. Various belated attempts were made to reduce carriage weight by incorporating some light alloys, including the production of an all-light-alloy carriage, but to no avail. It was 1939 before these weight-reduction projects were implemented and by then the forthcoming war shortages were already casting their shadows. Aluminium and other similar light metals were raw materials that the German economy could not supply lavishly, and all stocks were earmarked for the Luftwaffe. Thus the original steel carriage remained in production, though with some small modifications as the war progressed. One change brought replacement of the original steel-rimmed traction wheel type by a lighter version, sometimes with wooden spokes, but this had solid rubber tyres which lightened the load but little.

It was only when the sIG 33 was placed upon a self-propelled carriage that its full combat potential could be achieved. Starting in 1940 all manner of AFVs were used to carry the sIG 33, most of them conversions of captured vehicles or German tank chassis that were no longer being produced as battle tanks. In this way the PzKpfw I, II and III all acted as sIG 33 carriers, and the ex-Czech PzKpfw 38(t) chassis was another that was used. Some of these conversions were produced as standard models: the sIG 33 carriers from the PzKpfw II and PzKpfw 38(t) lines came into this category. Most of those which used captured French tank chassis were produced only in small numbers, although one based on the Lorraine ammunition carrier chassis was built in large numbers and became a 'standard' German army vehicle.

Red Army soldiers examine a pair of 15-cm sIG 33 infantry howitzers, with the soldier in the background wielding a rammer for some destructive purpose. Note the heavy carriage and large breech of the weapon in the foreground. Many of these weapons were lost to the enemy, as they were too difficult to move.

Manpower reduction

The use of self-propelled carriages for the sIG 33 also brought about a reduction in front-line manpower requirements, and after 1943 this was an important consideration for the German army. Men were still needed to look after the vehicles but the large numbers of men previously required to lead and look after the horses could now be used for other purposes. But it should be stressed that many units retained their horses until the very end of the war. Many garrison and second-line units retained their horses throughout every layer of their organizations and were consequently slow in response and manoeuvre compared with the mechanized formations.

But after 1943 the sIG 33 was no longer such an important weapon. Its usefulness had come to be overshadowed by the introduction of 120-mm (4.72-in) Soviet mortars into the German army. The effectiveness of these large mortars had so impressed the Germans that they promptly turned round any that they could capture and used them against their former owners. The Germans then went one better and started to produce direct copies. These 120-mm mortars were gradually issued to new units in place of the sIG 33. The mortars proved to be much easier to handle, and their large bombs were often only marginally less effective than the sIG 33 projectiles. They were also much cheaper and easier to produce, and after 1943 that was important to the German economy.

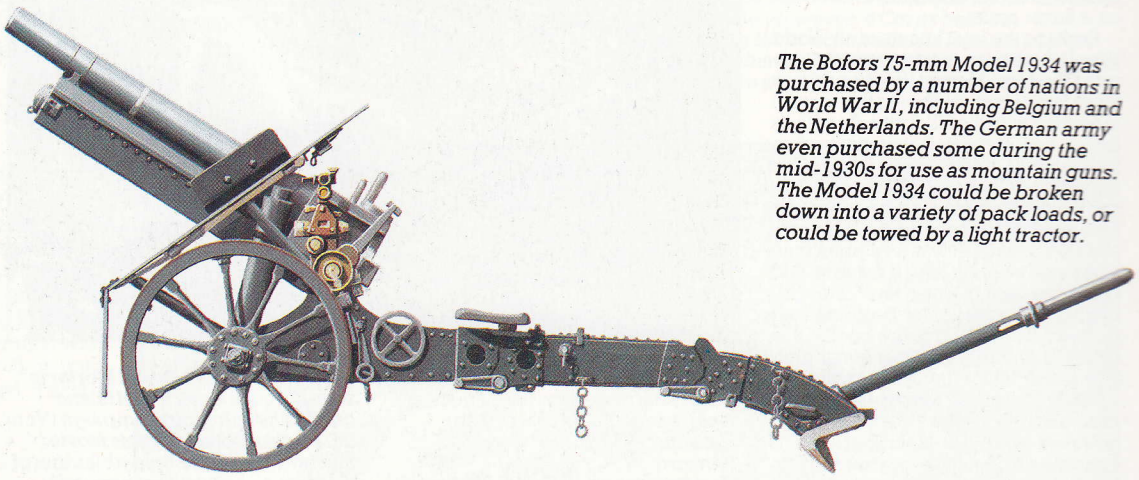
The sIG 33 was one of the last true infantry guns. Since 1945 they have faded from the tactical scene and the heavy mortar reigns supreme in their place.

SWEDEN

Bofors 75-mm Model 1934

The **Bofors 75-mm Model 1934** was originally designed by AB Bofors as a mountain gun and was placed on the market in the 1920s. At that time the artillery markets around the world were awash with the surplus of World War I, but there was a small demand for specialized weapons and the Bofors 75-mm (2.95-in) gun fell into this category. As with all products from the Bofors plant at Karlskroga, the 75-mm gun was very well made from the finest materials, and used a sound and well considered design. And it was just what was required by one European nation, the Netherlands.

One would have thought that the last thing a nation as well endowed with flat terrain as the Netherlands would have wanted was a mountain gun, but the Dutch needed the gun not for service at home but away on the other side of the world in the Dutch East Indies. At that time the Netherlands maintained a sizeable force of troops in the islands that now make up much of Indonesia, and as the terrain is either very overgrown or mountainous some form of pack artillery was required. The Bofors gun was apparently just what was needed and a batch was duly acquired. The Bofors gun could be broken down into eight loads, carried in special harnesses by mules, but for normal towing a four-horse team was used with a further six mules carrying ammunition and other bits and pieces; the gunners themselves had to walk. These guns were still in use when World War II reached the Pacific, and with the Japanese invasion the guns had a brief period of action before falling into Japanese hands. Their new masters used the guns for their own purposes until the ammunition stocks ran out, and by 1945 few were left.



The Bofors 75-mm Model 1934 was purchased by a number of nations in World War II, including Belgium and the Netherlands. The German army even purchased some during the mid-1930s for use as mountain guns. The Model 1934 could be broken down into a variety of pack loads, or could be towed by a light tractor.

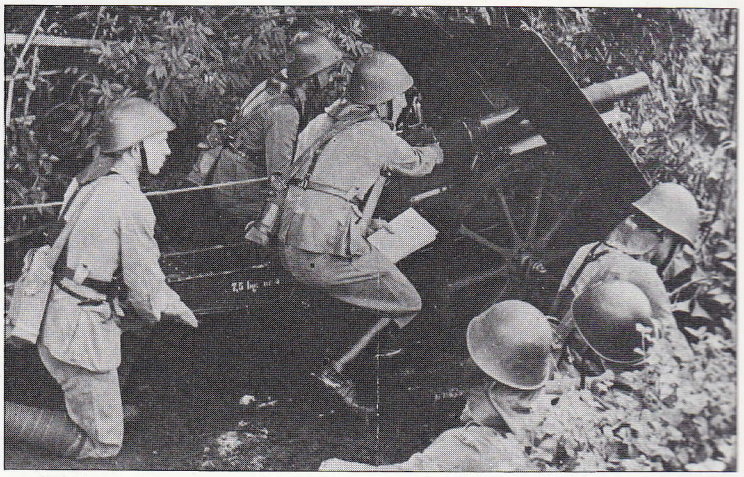
Some of these Bofors 75-mm guns were sold to Turkey in the years leading up to World War II, but the main customer was another unlikely client for a mountain gun. This time the recipient was Belgium, for which a special version was produced as the **Canon de 75 modèle 1934**. This time the gun was for use by the Belgian troops based along the borders in the Ardennes region, but as this area was reasonably well provided with roads and tracks, there was no need for the full pack transport facility. Instead the modèle 1934s were produced as 'one-piece' weapons with the only feature designed to save towing length being a section of the box trail that could be folded upwards on tow. Unlike the Dutch guns, the Belgian models were intended for towing by light tracked tractors and were delivered with rubber-tyred steel disc wheels.

The Belgian guns had little chance to shine, for when the Germans invaded in May 1940 they passed rapidly through the region where these guns were based. Thus the Bofors guns passed into German hands, but as the numbers involved were few the Germans made no use of this **7.5-cm Gebirgshaubitze 34** and the captured weapons were simply scrapped.

Specification

Model 34
Calibre: 75 mm (2.95 in)
Lengths: piece overall 1.8 m (70.87 in); barrel 1.583 m (62.32 in)
Weight: in action 928 kg (2,046 lb)
Elevation: −10° to +50°
Traverse: 8°
Muzzle velocity: 455 m (1,493 ft) per second
Maximum range: 9300 m (10,171 yards)
Projectile weight: 6.59 kg (14.53 lb)

The Netherlands army used their Bofors 75-mm Model 1934 howitzers in the Dutch East Indies, where they were carried into action in pack loads carried by mules. Note how brakes were applied to this carrier mule as it moved down a steep slope carrying the wheels and part of the carriage trails.



A Netherlands army Bofors 75-mm (2.95-in) Model 1934 howitzer is ready for action in the Dutch East Indies during 1941. The Japanese army overwhelmed this Dutch colony during early 1942 and took over many of these howitzers for their own local use until the war ended.

USA

US mortars

The US Army mortar teams have always referred to their charges as 'cannon' and during World War II they had a lot of cannon to hand. Smallest of these was not an American but a French design as it was the **60-mm Mortar M2**, a direct licence-produced copy of a Brandt design. This became the standard US Army mortar for use down to company level, and for it American industry produced a wide range of ammunition including one odd projectile that was meant to illuminate low-flying enemy aircraft at night so that light anti-aircraft weapons could deal with them; the round had other uses as well.

From the M2 the Americans developed their **60-mm Mortar M19**, which can be regarded as the US equivalent of the British 2-inch Mortar, which it closely resembled. Not many M19s were produced, and of these most went to airborne formations.

The standard battalion mortar of the US Army was another Brandt licence-built product, yet one more variation of the mle 27/31 design. The Americans produced their version as the **81-mm Mortar M1**, and with some slight alterations to suit local production methods it was manufactured throughout World War II. One odd American piece of equipment used with this weapon was a small hand cart onto which the mortar and its ammunition could be loaded. Two men were all that were required to tow this handy little carrier, known as the Hand Cart M6A1. Other carriers included mules, for which a special harness set was devised, but perhaps the most universally used was the M21 halftrack carrier from which the M1 mortar could be fired without the need to dismount the weapon as was the case on such vehicles as the British Universal Carrier. Throughout its service life the M1 remained virtually unchanged. A special barrel extension tube was devised to increase range but it was little used, and a special shortened version, known as the **T27**

'Universal' and of which much was expected, was not accepted for service on a large scale.

Perhaps the best known of all World War II American mortars was the **4.2-inch Chemical Mortar**, the main reason for its fame probably being that it is still in service with the US Army. As with its British counterpart, it was devised to be a mortar firing smoke projectiles (hence the Chemical Mortar designation), but it was not long before it was realized that HE bombs would be very effective as well. It was a cumbersome and large weapon with a massive and heavy baseplate (that was later replaced by much lighter designs), and the barrel was rifled to fire bombs that closely resembled conventional artillery projectiles. The rifling made the 4.2-inch Chemical Mortar very accurate, and the projectiles were much heavier than their smooth-bore equivalents. In action they were often used as infantry support weapons, but many were issued to smoke screen units. The one major drawback to the 4.2-inch Chemical Mortar was its weight and bulk. It was not an easy weapon to deploy and to overcome this various self-propelled carriages were devised for it.

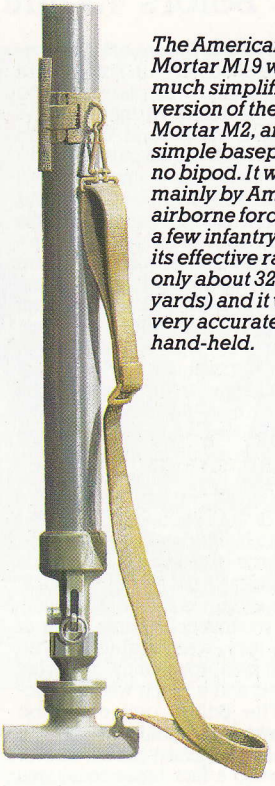
Specification
M2

Calibre: 60 mm (2.38 in)
Length: barrel 0.726 m (28.6 in)
Weight: in action 19.05 kg (42 lb)
Elevation: +40° to +85°
Traverse: 14°
Maximum range: 1815 m (1,985 yards)
Bomb weight: 1.36 kg (3 lb)

Above: A 4.2-in Chemical Mortar is seen in action on Arundel Island during the Solomons campaign. Note the stack of bombs for this mortar and how the shape resembles that of a conventional artillery projectile.

M1
Calibre: 81.4 mm (3.2 in)
Length: barrel 1.257 m (49.5 in)
Weight: in action 61.7 kg (136 lb)
Elevation: +40° to +85°
Traverse: 14°
Maximum range: 3008 m (3,290 yards)
Bomb weight: 3.12 kg (6.87 lb)

Chemical Mortar
Calibre: 106.7 mm (4.2 in)
Length: barrel 1.019 m (40.1 in)
Weight: in action 149.7 kg (330 lb)
Elevation: +45° to +59°
Traverse: 7°
Maximum range: 4023 m (4,400 yards)
Bomb weight: 14.5 kg (32 lb)



The American 60-mm Mortar M19 was a much simplified version of the 60-mm Mortar M2, and used a simple baseplate and no bipod. It was used mainly by American airborne forces and by a few infantry units, but its effective range was only about 320 m (350 yards) and it was not very accurate, being hand-held.

USA

75-mm Pack Howitzer M1A1

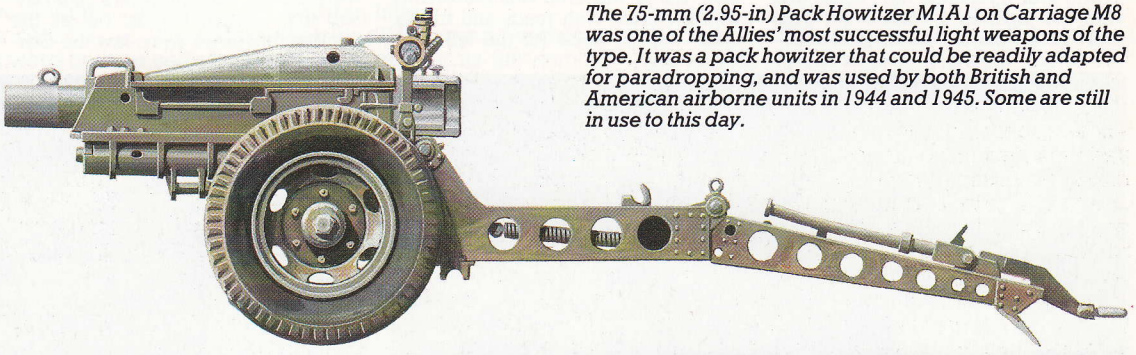
In the aftermath of World War I the 1920 Westervelt Board recommended the design of a new 75-mm (2.95-in) light howitzer for use in mountain warfare and as a general-issue pack howitzer. This was one of the proposals that was actually pursued at the time, for by 1927 the **75-mm Pack Howitzer M1** had been standardized; some later production changes altered the designation to the **M1A1**. The howitzer was mounted on a carriage of ingenious design that could be easily broken down into six loads, and the box trail was perforated to save weight. The howitzer itself could be broken down for pack transport, and was so arranged that the barrel was held in a trough and kept in place by a cover along the top: this gave the weapon a distinctive appearance. Traverse was effected using a screw mechanism directly on the axle, so the cradle had to carry only the elevation mechanism.

The first M1A1s were mounted on the Carriage M1, which was intended for animal traction and so had wooden-spoked wheels. The introduction of mechanized traction led to the adoption of the Carriage M8, which used rubber-tyred metal wheels. This little howitzer became one of the first Allied airborne artillery weapons, for it was issued to nearly every Allied airborne formation, including the British airborne divisions. But it should not be thought that the M1 carriage went out of fashion: many were produced during World War II for issue to Allied armies such as the Chinese, who used the howitzer in some numbers.

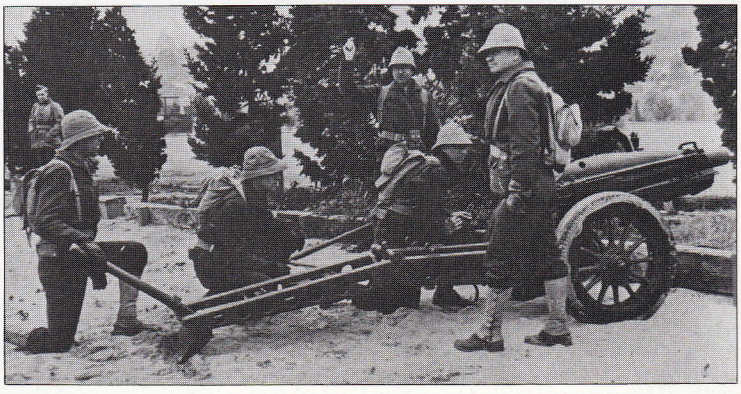
On either carriage the little M1A1 was a popular and very useful weapon. It was a thoroughly modern design, and in action it was easy to serve and could be used to provide fire support at ranges up to 8925 m (9,760 yards). Despite its light weight some conversions to the self-propelled role were made (some being mounted on half-tracks) and it was just as successful in that role. One role for which the M1A1 was not much used appears to be mountain warfare. There were few campaigns where mountain warfare was necessary for the Allies, with the possible exception of that in Yugoslavia. There partisan troops were trained in the use of the M1A1 by British officers, and the partisans appear to have made good use of them during the latter stages of their war of self-liberation.

It was as one of the first Allied airborne artillery pieces that the M1A1 will probably be best remembered. It was used at Arnhem when some were landed from General Aircraft Hamilcar gliders, but the howitzer could also be broken down into nine loads for paradropping.

Not all M1A1s had such an adventurous life. Many were used simply as infantry support weapons or as pack artillery in the dense jungles of the Far East. The M1A1 was light enough to take part in the initial stages of amphibious assaults such as that on Walcheren in 1944, when howitzers meant for mountain warfare were instead used in the flooded flatlands of the Scheldt estuary.



The 75-mm (2.95-in) Pack Howitzer M1A1 on Carriage M8 was one of the Allies' most successful light weapons of the type. It was a pack howitzer that could be readily adapted for paradropping, and was used by both British and American airborne units in 1944 and 1945. Some are still in use to this day.



A US Army light howitzer battery trains with a 75-mm (2.95-in) Pack Howitzer, attired in an odd uniform intended for use by expeditionary forces in tropical climates. Dating from 1936, this howitzer has early-pattern M8 carriage spoked wheels.

Specification
M1A1
Calibre: 75 mm (2.95 in)
Lengths: piece 1.321 m (52 in); barrel 1.194 m (47 in)
Weight: complete 587.9 kg (1,296 lb)
Elevation: −5° to +45°
Traverse: 6°

Muzzle velocity: maximum 381 m (1,250 ft) per second
Maximum range: 8925 m (9,760 yards)
Projectile weight: 6.241 kg (13.76 lb)

The Battle of Kohima

The war in Burma, fought in sodden rain forests, precipitous mountains and torrential rivers, was unlike any of the other campaigns of World War II. The epic struggles of the XIV Army to defeat the Japanese XV army are epitomized by the battle for Kohima.

Below: In order to take Kohima, it was essential that the Japanese take Imphal quickly for use as a supply base. However, 4 Corps held out, preventing the concentration of Japanese forces around Kohima. These troops from the 23rd Indian Division are attacking Nungshigum, north of Imphal.

'I fought at Kohima!'

There can be few men alive today who can make this claim, for the bones of many rest there still and the health of the majority who lived to reach home must have been affected by their ordeal; but whoever they are and whether their skin be white, brown or yellow they should be accorded respect, for they lived through a conflict comparable only with Stalingrad or Cassino in World War II or with Mort Homme at Verdun in World War I. It was a fight to the death.

The events which led to the battle began on the night of 7 March 1944 when Lieutenant-General R. Mutaguchi, commanding the Japanese 15th Army, launched Operation 'U-Go', throwing his divisions across the Chindwin river in an attack somewhat grandiloquently dubbed 'The March on Delhi'. The first stage of this was to be the isolation and then capture of the vast stores and administration centre which the British had built up at Imphal.

Chindwin crossing

Diversionary attacks were launched to the south of Imphal, but apart from the main assault on the depot the most important step was the move by the 31st Division under Lieutenant-General K. Sato, which crossed the Chindwin on 15 March and drove towards the small settlement of Kohima with its Naga village, its *maidan* on which the detachment of Assam Rifles drilled, its reinforcement camp in which soldiers returning from leave or hospital awaited their next move forward, its District Commissioner's bungalow with its terraced garden and tennis court, and its vital tactical position commanding the only road along which British reinforcements and supplies could reach Imphal from the railheads in Manipur.

Sato's orders, to be carried out with the utmost haste, were to drive his infantry battalions and their accompanying guns of the 31st Mountain Artillery Regiment in three columns across the countryside between the river and the settlement. Some idea of the size of his task is revealed by the fact that although the distance on the map was only 120 km (75 miles), his men had actually to march nearly 320 km (200 miles), their weapons, ammunition and supplies being carried on mules, elephants and oxen, of which the first and last categories were regarded as meat on the hoof. It is a tribute to the Japanese soldiers and their commander that their forward units reached the northern outskirts of Kohima at 04.00 on the morning of 5 April.

They found facing them a hastily-organized defence perimeter manned at that moment by some 1,500 men, mostly of the 4th Royal West Kents augmented by men of the Assam Rifles (streaming back from forward positions where they had been both observing and attempting to delay Sato's advance) and the faithful, tenacious and extraordinarily courageous Naga villagers. One vital British formation of which the first Japanese arrivals remained for some time in ignorance, however, was a battery of 3.7-in (94-mm) howitzers sited on the reverse slope of a hill at Jotsoma 3.2 km (2 miles) to the west of Kohima, manned by Indian gunners of

The Naga village on Kohima ridge was captured during the Japanese offensive in early April, and retaken by the 5th Brigade of the 2nd British Division during the encircling operation a month later.

the 161st Indian Brigade, of which the 4th Queen's Own Royal West Kents were one battalion and the 1/1st Punjabis and the 4/7th Rajputs the other two. These battalions were moving down from Dimapur to join the defence.

Within hours of arrival the men of the Japanese 58th Regiment were giving proof of their ferocity, and the Royal West Kents of their stubbornness. The Japanese swept around Kohima from the Naga village to Jail Hill and on the night of 6 April, strengthened as more of their compatriots arrived, succeeded in taking two more of the features inside the defence perimeter, known as D.I.S. and F.S.D. But their attacking units were annihilated on the next morning by the counterattack of the Royal West Kents.

However, by now more and more of Sato's 12,000 infantry and their gunners were coming up, and he himself was confident of success within 48 hours, though seven days later this confidence was waning. On the night of 13 April massed attacks by wave after wave of cheering assault troops foundered on the rock of the stubborn infantry defence, aided by astonishingly accurate fire from the howitzers at Jotsoma, which broke up their formations as soon as they assembled, accompanied the waves all the way forward to the defences, and harried the survivors as soon as they were ordered back.

British delay

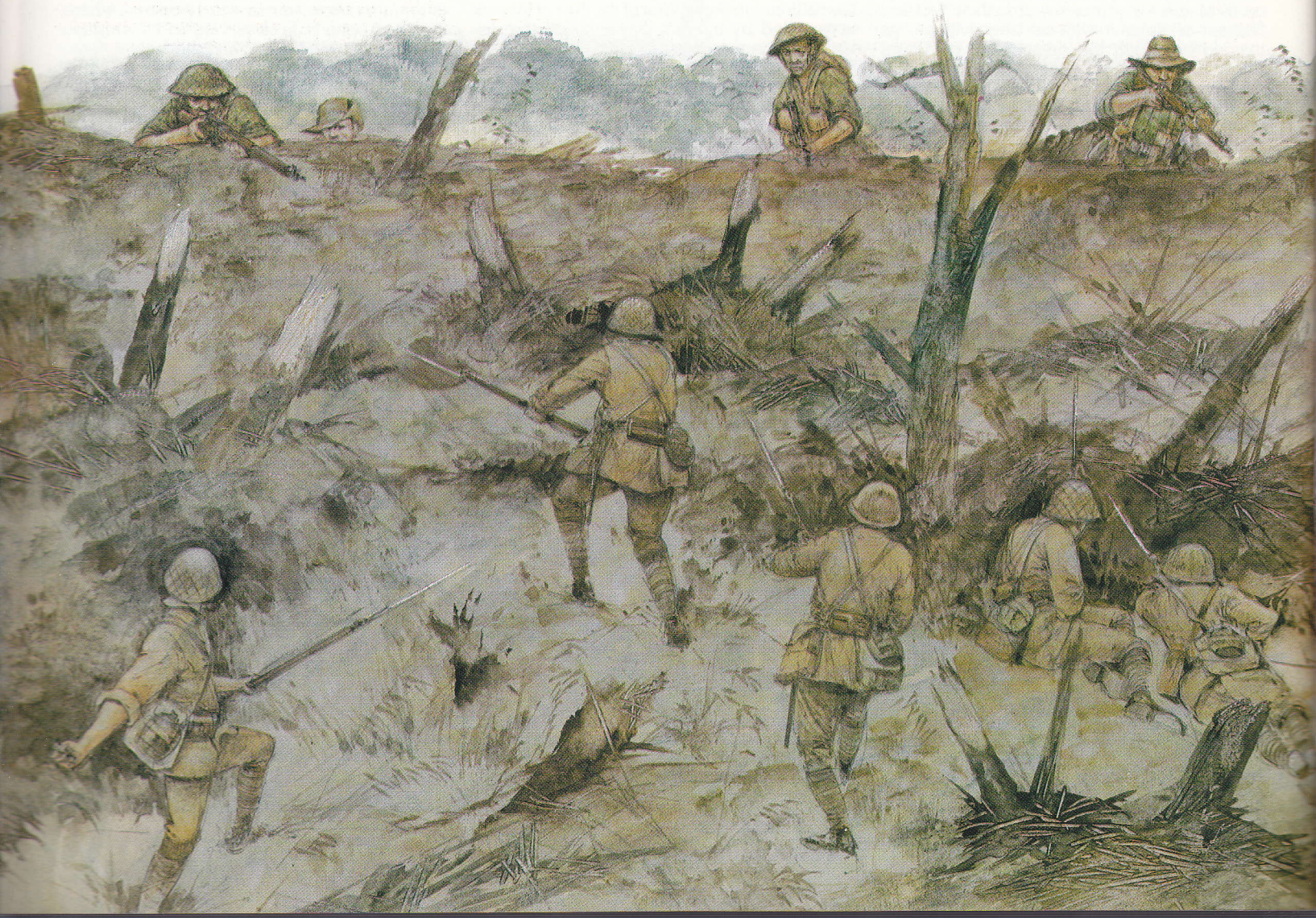
And on the following day reinforcements for the hard-pressed British got through to Jotsoma and began planning to blast their way through the last 3.2 km (2 miles). This was to prove appallingly difficult and a necessary delay of 24 hours almost fatal, for during that night the Japanese blasted F.S.D. with every shell and mortar bomb their weapons could fire; the perimeter began to disintegrate, the F.S.D. position and neighbouring Kukri Piquet was lost.

But at 08.00 on 18 April, the British at Jotsoma and the surrounding area replied with a devastating bombardment of the same kind and under its protection the relief of the original garrison was carried out. The Royal West Kents, the survivors of the Assam Rifles and those of the composite companies formed from the reinforcement depot dragged themselves out through the grisly evidence of their ordeals, and the men of the Royal Berkshire Regiment and the Durham Light Infantry took their places.

But the battle was by no means over. On the British side, brigades of the 2nd Division were pouring down the road from Dimapur, while on the Japanese side more and more of Sato's 31st Division were being deployed, and as there was physically not enough room in the Kohima area for two whole divisions to operate, encircling moves were attempted by both sides through the appallingly difficult country around Kohima. This was such that a rate of movement of 1.6 km (1 mile) per day against no enemy opposition came to be accepted as the norm, and when on 27 April rain began falling with a weight and ferocity which none of the troops on either side had ever experienced before, movement became almost impossible and diarrhoea and dysentery took an even greater toll than bullets and shrapnel.

And all the time, on the central Kohima Ridge, the kernel of the battle was being fought. The Durhams fought off an attack on Garrison Hill which cost Sato such high casualties that he ordered a cessation of night attacks,

The Japanese prided themselves on the ferociousness of their infantry assaults, but in the face of tough opposition their fanatical attacks led to severe casualties. Here the Japanese charge has almost overrun a British position at Kohima. Such assaults were often only halted at point-blank range, and, in the savage close-quarter fighting which followed, grenades, sub-machine guns and even bayonets and entrenching tools became the prime weapons.



and he sent a caustic signal to Mutuguchi complaining of the time the latter was taking to capture Imphal, and also of the total lack of support or supplies coming through to him at Kohima.

Reinforcements

Now it was becoming a battle of logistics, and the British were winning it. Not only were supplies flowing down from Dimapur, but also more mountain artillery, and even mobile artillery in the form of tanks. And by the end of April the 2nd Dorsetshires had begun fighting their way into Kohima towards the District Commissioner's bungalow, and reached the edge of the tennis court. This now became the scene of an almost Pyrrhic conflict.

The opposing forces were separated by less than 22 m (25 yards), but the Japanese had got there earlier and, great diggers always, had burrowed deep into the terrace which rose at the far end, and also under a big water-tank which dominated the area. No one could move across the open area in daylight, and Dimapur stores were astonished by the continual demands for gym shoes for night patrolling! But though these proved effective, the battle dragged on with ever-increasing ferocity, and it was not until the middle of May, when a single tank managed the tortuous route up the District Commissioner's drive and began blasting the Japanese bunkers, that the British could claim even 'the first set'.

A British machine-gun enjoys a commanding position overlooking a Burmese hill village. Clearings could be open killing grounds in the early stages of a jungle battle, but after prolonged action large areas of forest were destroyed, creating a shattered, alien landscape reminiscent of the battlefields of World War I.

The Battle of Kohima

Gurkhas in Burma man their 3-in mortar. Mortars proved valuable in the jungle, the high trajectory being an advantage when operating under the canopy, as normal artillery would have very restricted arcs of fire.

Like the mortar, the infantry pack gun proved of value in Burma. Designed to be loaded on muleback, on the grounds that anywhere a man can go a mule can usually follow (unlike wheeled or tracked vehicles), the Japanese 75-mm infantry gun had a range of 7000 m (7,650 yards).

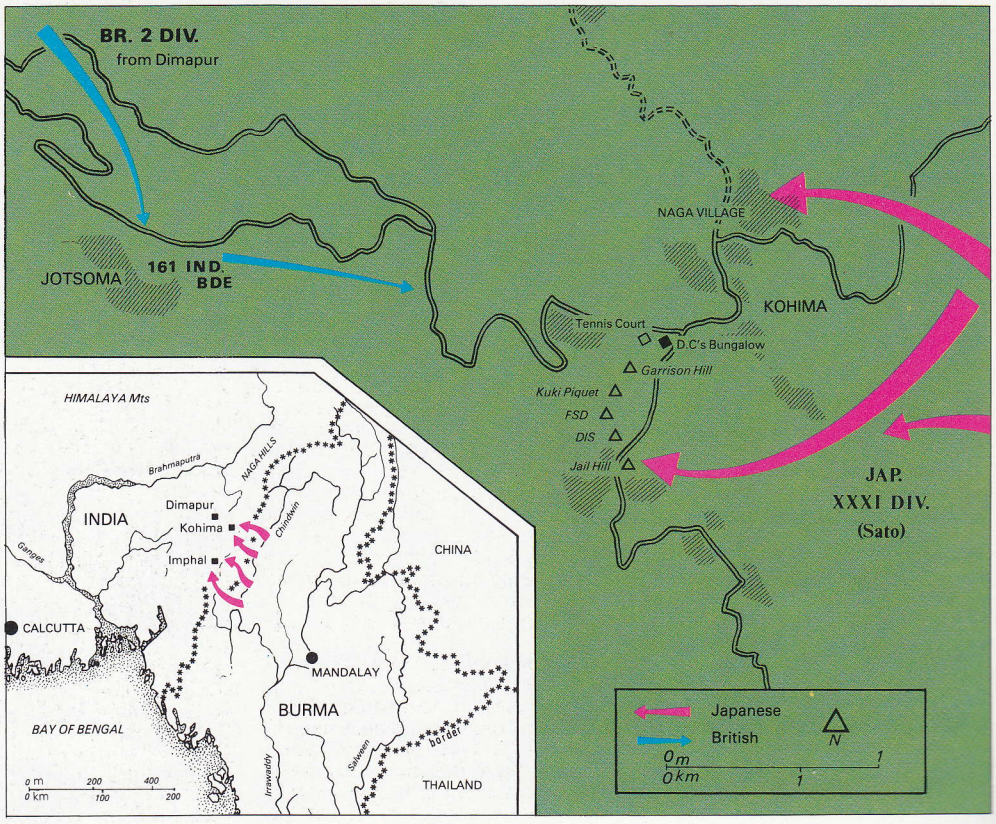
But more tanks arrived (of 149th RAC) and more infantry; and during May the men of the Manchesters, the Royal Scots, the Royal Norfolks, the Worcesters, the Queen's Own Cameron Highlanders and the Royal Welch Fusiliers came up to help the men already in Kohima, amid their ordeal of shell and bomb-burst and the incessant chatter of rifle and machine-gun, facing the almost unbelievable bravery and ferocity of the Japanese soldiers.

Nothing was coming up for them: Mutaguchi's attack on Imphal was blocked by the garrison there, and far from sending help up to Sato he had demanded the release to him of one of Sato's battalions. All Sato received during the entire campaign were words of empty encouragement, orders which he was unable to obey and promises of victory at Imphal which were never kept; and all the time his men were sacrificing their lives, for as usual none of them allowed themselves to be taken prisoner and there was nothing for the wounded to do but to die; and Sato's strength was falling.

By the end of May Sato knew that he could not take Kohima, and further sacrifice was pointless. After an angry exchange of signals with Mutaguchi, in one of which he pointed out that since crossing the Chindwin his force had received not a single bullet or grain of rice, let alone any reinforcements, he sent off his last angry jibe ("The tactical ability of 15th Army Staff lies below that of cadets."), closed down his radio and ordered his men to retire.

This the Japanese soldiers reluctantly did, desperately fighting off the clutches of the now all-encircling British and firing off the last of their mortar bombs and shells. And the story of their agonizing walk back to the Chindwin, living on grass and roots, their clothing and boots in tatters, using canes or their broken rifles as crutches, is an epic of endurance and courage which no soldier will ever decry, certainly not the equally valorous men who fought them.

The eventual failure of the Japanese offensive at Kohima sealed the fate of the Japanese army in Burma, and from June 1945 they were remorselessly pushed back by a triumphant XIV Army. Despite its importance, the struggle for Burma has often been overshadowed by events nearer to home, earning the eventual victors the title of 'The Forgotten Army'.



JAPAN

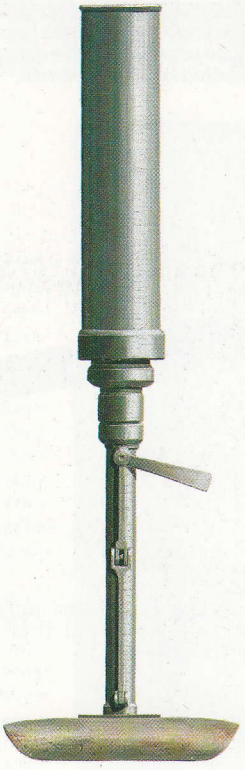
50-mm light mortars

There were two main types of 50-mm (1.97-in) mortar in service with the Japanese army during World War II. Both of them could be regarded more as grenade-launchers than real mortars as they used projectiles that were little more than finned hand grenades, and they were mainly used as squad weapons for purely local support.

The first version to enter service was the **Type 10**, which entered service in 1921. It was a simple smooth-bore weapon that fired its grenade by means of a trigger mechanism. An adjustable gas vent was provided to give variations in range. The Type 10 originally fired HE grenades, but with the introduction of the later model it was used more and more to fire pyrotechnic grenades for target illumination and similar purposes. The main drawback of the Type 10 was its limited range, which was only some 160 m (175 yards), a factor that gave rise to development of the second weapon in this class, the **Type 89**.

By 1941 the Type 89 had all but replaced the Type 10 in service and differed from it in several respects, one being that the barrel was rifled instead of smooth-bored. The other main change was the elimination of the previous gas vent system in favour of a firing pin that could be moved up and down the barrel: the higher the firing pin was up the barrel the shorter the resultant range. The Type 89 mortar fired a new series of grenades to an effective range of 650 m (711 yards), which was a substantial increase over that possible with the Type 10. Grenades developed for the Type 89 included the usual HE, smoke, signalling and flares. Development of this weapon reached the point where a special version for use by airborne troops was produced. Normally both the Type 10 and Type 89 could be dismantled for carrying in a special leather case.

The main version encountered by the Allies was the Type 89. Somehow, the word spread among the Allies that these little mortars were 'knee' mortars and the name stuck. Exactly how many fractured thighs this completely misleading nickname caused among untrained users is now impossible to determine, but attempting to fire either of these mortars with the baseplate resting against a leg would result in immediate injury. The recoil of these little weapons was considerable and the baseplate had to be held against the ground or something really substantial. Aiming was rudimentary for there were no sights other than a line marked on the barrel, but in a short time almost any soldier could learn to use the weapon fairly effectively. The mortar was light and handy in action, but the grenade was somewhat on the light side. What really mattered was that any soldier could carry one slung over a shoulder while still carrying a normal load and the resultant increase in squad firepower was appreciable, especially when using the longer-range Type 89.



The Japanese 50-mm (1.97-in) Grenade Discharger Type 10 was first produced in 1921 and later replaced by the improved Type 89. With a limited range (160 m/175 yards), it remained a light and handy weapon that could fire a range of HE, smoke and flare grenades.

How not to do it. For some reason the Americans decided that the small spade baseplate of the Japanese grenade dischargers enabled a soldier to fire them from the thigh or knee (hence 'knee mortars'), but anyone attempting this inevitably ended up with a broken leg, for the recoil forces were considerable.

Specification

Type 89

Calibre: 50 mm (1.97 in)
Lengths: overall 0.61 m (24 in); barrel 0.254 m (10 in)
Weight: 4.65 kg (10.25 lb)

Maximum range: 650 m (711 yards)
Grenade weight: 0.79 kg (1.74 lb)

JAPAN

70-mm Battalion Gun Type 92

The little **70-mm Battalion Gun Type 92** was one of the most successful infantry support weapons of World War II, despite its rather odd appearance. It was issued to every Japanese infantry battalion and could be used in several ways, as a battery weapon or, more frequently, as an individual weapon to produce harassing fire.

Despite its odd appearance the Type 92 was a thoroughly modern design. Much of the unusual appearance came from the use of a short barrel on a carriage travelling on large steel disc wheels. Normally the gun was towed by horses or mules, but in typical Japanese fashion there were various holes and brackets on the carriage through which long poles could be inserted to act as man-carrying handles for short moves. The shield could be removed to save weight when required, and the wheels were supported on cranked axles that could be turned through 180° to lower the silhouette of the gun when occasion demanded. Although it was a small weapon, the Type 92 required a crew of 10 men, most of these being used for manhandling or carrying the gun and acting as ammunition suppliers. In action the maximum number required was only five.

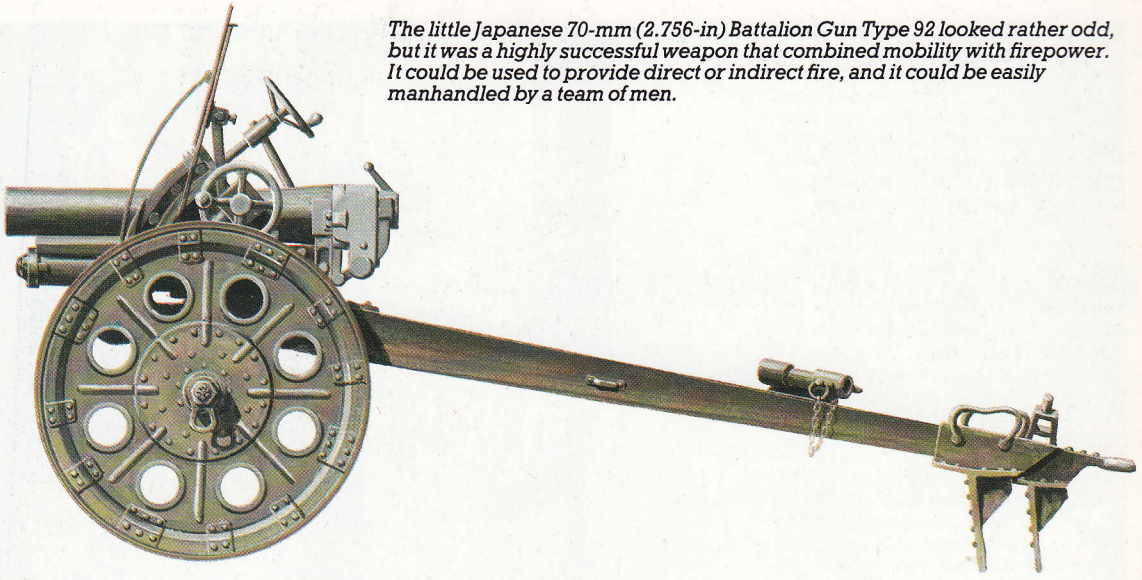
The Type 92 fired the usual HE projectiles along with smoke and shrapnel for close-range use against personnel in the open. There was also a rather

A team of Japanese Army gunners tows a Type 92 Battalion Gun over rough ground in the Aleutian Islands. The team are using special towing harnesses and are carrying wicker back-packs containing ammunition and spares for the gun. In action the gun weighed only 212.47 kg (468 lb).

ineffective armour-piercing projectile. The maximum range was rather short, being only some 2745 m (3,002 yards), and the effective range was only about half that, but as the Type 92 had only very simple sights and was rarely used against targets other than those clearly visible, this mattered but little in action. The Type 92 was certainly used well forward. Its direct or plunging fire could be very effective, in both defence and attack, and some Allied reports speak of the Type 92 being used in the same manner as a mortar. One operational method that was developed to a fine art by the Japanese for the Type 92 was harassing fire in jungle warfare. A small team would drag or carry the Type 92 forward, fire off a few rounds at a known target and then move hastily on to a new fire position or out of the area altogether. A single gun could keep large bodies of Allied soldiers awake and alert by such simple tactics.

Although labelled as a gun, the Type 89 used a variable propellant charge system and could be fired in the upper register (i.e. above an elevation angle of 45°) to drop projectiles onto targets as close as 100 m (109 yards) away. On target the HE projectiles were very destructive, and the shrapnel shell often proved to be very effective in breaking up massed infantry attacks such as those sometimes used by the Chinese army. There was even a version of the Type 89 developed for use in some experimental tanks, but only a few of these (known as the **Type 94**) were actually produced.

The Type 92 was a small artillery piece but it often had an effect on its enemies that was quite out of proportion to its size, range and projectile weight. Many are still prized as museum pieces.



The little Japanese 70-mm (2.756-in) Battalion Gun Type 92 looked rather odd, but it was a highly successful weapon that combined mobility with firepower. It could be used to provide direct or indirect fire, and it could be easily manhandled by a team of men.

Specification
Type 92
Calibre: 70 mm (2.756 in)
Length: barrel 0.622 m (24.5 in)
Weight: in action 212.47 kg (468.4 lb)
Elevation: −10° to +50°
Traverse: 90°
Muzzle velocity: 198 m (650 ft) per second
Maximum range: about 2745 m (3,000 yards)
Projectile weight: HE 3.795 kg (8.37 lb)

FRANCE

Mortier Brandt de 81 mm modèle 27/31

Even though the Stokes Mortar of World War I established the overall design shape and form of the modern mortar, it was still a very rudimentary weapon. The Stokes Mortar was little more than a pipe supported on a simple frame and sitting on a base plate to take the recoil forces. The French Brandt company changed all that in the years after World War I by a careful redesign and drastic improvement in the type of bomb fired. At first sight the Brandt-inspired modifications were difficult to detect for the overall form of the Stokes design remained, but the improvements were there nevertheless. One of the first was that the new Brandt model, introduced as the **Mortier Brandt de 81 mm modèle 27** in 1927 and updated again in 1931 as the **modèle 27/31** to take advantage of ammunition improvements, was in the overall handiness of the weapon.

Setting up the original Stokes Mortar often took time, but the redesign of the Brandt bipod was such that it could be set up on any piece of ground: the levelling of the sights was easily carried out by the bipod leg design, on which only one leg needed to be adjusted. The sights were clamped to a position close to the muzzle, one that was convenient for the layer to peer through without having to stand over the weapon, and slight changes of traverse were easily made using a screw mechanism on the sight bracket. But the main changes came with the ammunition. The early grenades of the Stokes Mortar were replaced by well-shaped bombs that not only carried more explosive payload but had a much greater range. In fact Brandt produced a wide range of mortar bombs for its mle 26/31, but they fell into three main brackets. First there was one with an HE payload, and this was used as the standard bomb. Then there was a bomb that was twice the weight of the standard, but which had a shorter range. The third type of bomb used was smoke. Within these three categories came numerous marks and sub-marks; for instance various coloured smokes were available.

The mle 27/31 greatly influenced mortar designs from the moment it was announced. Within a few years the mle 27/31 was being either licence-produced or simply plagiarized all over Europe and elsewhere. The mortar's calibre, 81.4 mm (3.2 in), became the virtual European calibre for infantry mortars and nearly every infantry mortar in use during World War II had some feature or other derived from the mle 27/81, and many were direct copies. This influence was wide enough to encompass the standard mortars of Germany, the USA, the Netherlands, China and even the USSR. All of these nations made their own alterations and innovations, but the resultant weapons were all basically the mle 27/31 at heart even if the mle 26/31 was in its turn derived from the Stokes Mortar.

The Brandt influence survives to this day, although the weapons of the current generation of 81-mm mortars outrange the mle 27/61 by a factor of nearly six. But the mle 27/31 was more than good enough to be used in its many forms throughout World War II and for years after it.

The French Brandt 81-mm (actually 81.4-mm/3.2-in) modèle 27/31 was one of the most influential mortar designs of its generation; many World War II mortars such as those used in America and Germany were greatly influenced by its overall design. Several French versions existed, but the 'classic' form is shown here.

Specification
Mortier Brandt de 81 mm mle 27/31
Calibre: 81.4 mm (3.2 in)
Lengths: barrel 1.2675 m (49.9 in); bore 1.167 m (45.94 in)
Weights: in action 59.7 kg (131.6 lb); barrel 20.7 kg (45.6 lb); bipod 18.5 kg (40.8 lb); base plate 20.5 kg (45.2 lb)
Elevation: +45° to +80°
Traverse: 8° to 12° variable with elevation
Maximum range: standard bomb 1900 m (2,078 yards); heavy bomb 1000 m (1,094 yards)
Bomb weight: standard 3.25 kg (7.165 lb); heavy 6.9 kg (15.21 lb)

Warsaw Pact Part 2

Poland

Poland is the largest of the Soviet Union's Warsaw Pact allies, and its armed forces use a mixture of Soviet and indigenous equipment. The 2S1 122-mm self-propelled gun seen here was introduced in the 1970s, being first observed at a Polish parade in July 1974.

The independence of Poland was finally recognized by the Treaty of Versailles in 1919, but just 20 years later invasion and conquest of the country by Germany led to the outbreak of World War II. The German eastward advance of 1939 was complemented by a Soviet westward advance. When the Soviet Union finally entered World War II Polish units were formed to fight the Germans, although many Poles had escaped to the West soon after the German invasion of Poland to fight with the French and British. After the end of the war none of the Poles who had fought with the Western Allies were allowed to join the new Polish army, which was organized, trained and equipped along Soviet lines.

Today Poland is the home of the Soviet Northern Group of Forces, comprising an army HQ and the 20th and 38th Tank Divisions. In time of war with NATO, Poland would play a vital role as most of the reinforcements from the Soviet Union would have to pass through the country to reach East Germany.

Poland has the largest armed forces in the Warsaw Pact other than those of the Soviet Union itself, and the Polish forces are considered by many to be the best, with considerable amounts of new equipment issued in recent years.

The Polish armed forces have a total strength of 323,000, of whom 185,000 are conscripts. In the army, air force and internal security forces conscripts serve two years, while in the navy and special services they serve three years. Reserves for the armed forces total some 500,000.

Polish Army

Poland is divided into three military districts (Pomerania, Silesia and Warsaw), and the army has a total strength of 210,000 officers and men, of whom about 155,000 are conscripts. There are five tank divisions (the 5th, 10th, 11th, 16th and 20th), eight motorized rifle divisions (the 1st, 2nd, 3rd, 4th, 8th, 9th, 12th and 15th), one airborne division (the 6th, stationed near Czech border), one amphibious assault division (the 7th), three artillery brigades, one artillery and three anti-tank regiments, four surface-to-surface missile brigades with 'Scud' missiles and one air-defence brigade. The last has seven regiments with SA-6 'Gainfuls' and two with SA-8 'Geckos'.

Army equipment includes 3,400 T-54/T-55 MBTs, 100 or more T-72 MBTs, 100 or more PT-76 light tanks, 800 FUG and BRDM-2 4×4 amphibious scout cars, 800 BMP-1 MICVs, and 2,500 OT-62 and OT-64 armoured personnel carriers. Artillery includes 150 152-mm (6-in) M1937 gun/howitzers, 500 122-mm (4.8-in) D-30, M1938 and 2S1 howitzers (with the last being self-propelled), 130 152-mm M1943(D-1) howitzers, 250 multiple rocket-launchers including the 122-mm BM-21, 140-mm (5.5-in) BM-14 series, 140-mm WP-8 and 240-mm (9.45-in) BM-24. There is also a variety of anti-tank guns and other older artillery held in reserve. Surface-to-surface launchers consist of 36 for the 'Scud' and 51 for the FROG series; these can be fitted with a variety of warheads, including tactical nuclear in Soviet control. ATGWs include the AT-3 'Sagger', AT-4 'Spigot' and the old AT-1 'Snapper', plus recoilless rifles and 85-mm (3.35-in) D44 and 100-mm (3.9-in) T-12 guns. Anti-aircraft weapons include SA-4 'Ganef', SA-6 'Gainful, SA-7 'Grail', SA-8 'Gecko' and SA-9 'Gaskin' surface-to-air missiles, plus 23-mm ZU-23, 57-mm S-60, 85-mm KS-12 and 100-mm KS-19 towed anti-aircraft guns, as well as 23-mm ZSU-23-4 and 57-mm ZSU-57-2 self-propelled anti-aircraft guns.

The Polish air force is equipped with nearly 700 combat aircraft organized along Soviet lines. Air defence is still entrusted to about 350 late model MiG-21s, seen here in natural metal finish. It is believed that the first squadrons of their replacements, MiG-23s, have recently become operational.

The country is self-sufficient in small arms production, and produced the Soviet T-55 MBT until 1982. It is now tooling up to make the T-72 MBT.

Polish Air Force

The Polish air force has a total strength of 91,000 officers and men, of whom 30,000 are conscripts, and has just under 700 combat aircraft. There are 11 air-defence squadrons with 400 Mikoyan-Gurevich MiG-21 series fighters, 18 fighter/ground-attack squadrons (12 with 150 MiG-15s, three with 35 Sukhoi Su-7s and three with 35 Su-20s), six reconnaissance squadrons with the MiG-21RF, Ilyushin Il-28 and LIM-6, two transport regiments with about 30 aircraft, and three helicopter regiments. The last have 100 Mil Mi-2, 12 Mi-4, 25 Mi-8 and over 20 Mi-24 helicopters. There are also some 300 training aircraft including the Polish-built TS-8s and TS-11s. For almost 20 years Poland has built the Mi-2 (NATO reporting name 'Hoplite') light helicopter for the home and export markets, and by 1985 is believed to have produced some 4,000 examples, of which perhaps half have been supplied to the Soviet Union.

The Polish air force also controls three air-defence divisions, which have some nine SAM regiments covering 50 sites with 400 launchers for SA-2 'Guideline' and SA-3 'Goa' missiles.

Polish Navy

The Polish navy has a strength of 22,000 officers and men, 5,000 of them conscripts. Warships include four 'Whiskey' class conventional submarines, one 'SAM Kotlin' class AA destroyer, 13 'Osa I' fast attack craft (missile), five 'Obluze' class patrol craft, one 'Oksywie' class patrol craft, eight 'Modified Obluze' class large patrol craft, nine 'Gdansk' class large patrol craft, eight 'Wisla' class torpedo boats, 14 'Pilica' class patrol craft, 21 'K 8' class coastal patrol craft, 12 'Wisloka' class coast patrol craft, 12 'Krogulec' class coastal minesweepers, 12 'T-43' class ocean minesweepers, 23 'K 8' minesweeping boats, 23 'Polnocny' class LCTs (based on a Soviet design), three 'Marbut' LCMs and 15 'Eichstaden' class LCPs. In addition there are many training ships, intelligence craft, recovery ships, survey craft and auxiliaries. Some of these ships, such as the 'Wisloka', 'Gdansk' and 'K 8' units, are manned by the interior border troops.

The navy also has some 2,000 men in coastal defence and a similar number in naval aviation. The latter includes an attack regiment with three squadrons of MiG-17s, one reconnaissance squadron with MiG-17s and Il-28s, and two squadrons of helicopters including Mi-2, Mi-4 and Mi-8 types.

Para-military forces include the Citizens' Militia with a total strength of 350,000, Ministry of the Interior Border Troops with a strength of 161,000 and Internal Defence Troops with a strength of 58,000 officers and men.

Above: Although most of the 160-strong force has now been replaced by Sukhoi Su-20s, some Su-7Bs still soldier on. In keeping with Soviet military philosophy, the Polish air force is seen as a tactical force to augment army artillery.

Below: OT-62As of the Polish amphibious assault division come ashore from a 'Polnocny' class LCT during an exercise on the Baltic coast. The OT-62 is a Czech development of the Soviet BTR-50 and features a more powerful engine, and full NBC protection. It entered Polish service in 1966.

Below: Polish infantry are armed with the PMK, a Polish copy of the Soviet AK-47 assault rifle. Poland has also exported the weapon to Bulgaria. The PMK comes in both solid and folding butt versions, and differs little from the Soviet original.